

INDEPENDENT ORBITER ASSESSMENT

ANALYSIS OF THE EXTRAVEHICULAR MANEUVERING UNIT

15 DECEMBER 1986

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY
HOUSTON DIVISION

SPACE TRANSPORTATION SYSTEM ENGINEERING AND OPERATIONS SUPPORT

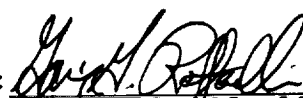
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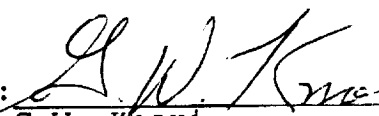
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Independent Orbiter Assessment Analysis of the Extravehicular Mobility Unit

1.0 EXECUTIVE SUMMARY

The McDonnell Douglas Astronautics Company (MDAC) was selected in June 1986 to perform an Independent Orbiter Assessment (IOA) of the Failure Modes and Effects Analysis (FMEA) and Critical Items List (CIL). Direction was given by the STS Orbiter and GFE Projects Office to perform the hardware analysis using the instructions and ground rules defined in NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. The IOA approach features a top-down analysis of the hardware to determine failure modes, criticality, and potential critical items. To preserve independence, this analysis was accomplished without reliance upon the results contained within the NASA FMEA/CIL documentation. Hardware identified for assessment includes major critical Shuttle Orbiter subsystems and all GFE hardware. This report documents the independent analysis results corresponding to the Extravehicular Mobility Unit (EMU) hardware.

The EMU is an independent anthropomorphic system that provides environmental protection, mobility, life support, and communications for the Shuttle crewmember to perform Extravehicular Activity (EVA) in Earth orbit. Two EMU's are included on each baseline Orbiter mission, and consumables are provided for three two-man EVA's.

The EMU consists of the following elements:

- o Life Support System (LSS)
 - o Primary Life Support Subsystem (PLSS)
 - o Secondary Oxygen Pack (SOP)
 - o Service and Cooling Umbilical (SCU)
 - o Display and Control Module (DCM)
 - o Extravehicular Communications System (EVCS)
- o Caution and Warning System (CWS)
- o Space Suit Assembly (SSA)
 - o Hard Upper Torso (HUT)
 - o Helmet
 - o Arm Assembly
 - o Glove Assembly
 - o Lower Torso Assembly (LTA)
 - o Liquid Cooling and Ventilation Garment (LCVG)
 - o Insuit Drink Bag (IDB)
 - o Urinary Collection Device (UCD)
 - o Communications Carrier Assembly (CCA)

The IOA analysis process utilized available EMU hardware drawings and schematics for defining hardware assemblies, components, and hardware items. Each level of hardware was evaluated and analyzed for possible failure modes and effects. Criticality was assigned based upon the severity of the effect for each failure mode.

Figures 1 and 2 present a summary of the failure criticalities for each of the three major subdivisions of the EMU. A summary of the number of failure modes, by criticality, is also presented below with Hardware (HW) criticality first and Functional (F) criticality second.

Summary of IOA Failure Modes By Criticality (HW/F)							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
Number :	11	219	123	14	95	35	497

For each EMU failure mode identified, the criticality and redundancy screens were examined to identify Potential Critical Items (PCIs). A summary of PCIs is presented as follows:

Summary of IOA Potential Critical Items (HW/F)						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
Number :	11	219	123	13	24	390

The majority of these PCIs are resultant from failures which cause loss of one or more primary functions: pressurization, oxygen delivery, environmental maintenance, and thermal maintenance. It should also be noted that the quantity of PCIs would significantly increase if the SOP were to be treated as an emergency system (as it is so defined in the EMU specifications document SVHS7800) rather than as an unlike redundant element (as it is presently categorized by the NASA).

EMU IOA ANALYSIS SUMMARY						
CRIT	1/1	2/1R	2/2	3/1R	3/2R	3/3 TOTAL
#FM	11	219	123	14	95	497
#PCI	11	219	123	13	24	390

LSS IOA ANALYSIS SUMMARY						
CRIT	1/1	2/1R	2/2	3/1R	3/2R	3/3 TOTAL
#FM	7	187	82	14	83	466
#PCI	7	187	82	13	24	313

CWS IOA ANALYSIS SUMMARY						
CRIT	1/1	2/1R	2/2	3/1R	3/2R	3/3 TOTAL
#FM	-	-	7	-	-	7
#PCI	-	-	7	-	-	7

SCU			
CRIT.	#FM	#PCI	
2/1R	2	2	
2/2	5	5	
3/2R	27	8	
3/3	3	-	

EVCS		
CRIT	#FM	#PCI
3/2R	9	-

DCM			
CRIT.	#FM	#PCI	
1/1	1	1	
2/1R	34	34	
2/2	47	47	
3/1R	5	4	
3/2R	48	8	
3/3	9	-	

SOP			
CRIT.	#FM	#PCI	
1/1	4	4	
2/1R	18	18	
2/2	2	2	
3/2R	5	2	
3/3	1	-	

PLSS			
CRIT.	#FM	#PCI	
1/1	2	2	
2/1R	135	135	
2/2	28	28	
3/1R	9	9	
3/2R	12	6	
3/3	12	-	

CRIT - CRITICALITY
FM - FAILURE MODE
PCI - POTENTIAL CRITICAL ITEM

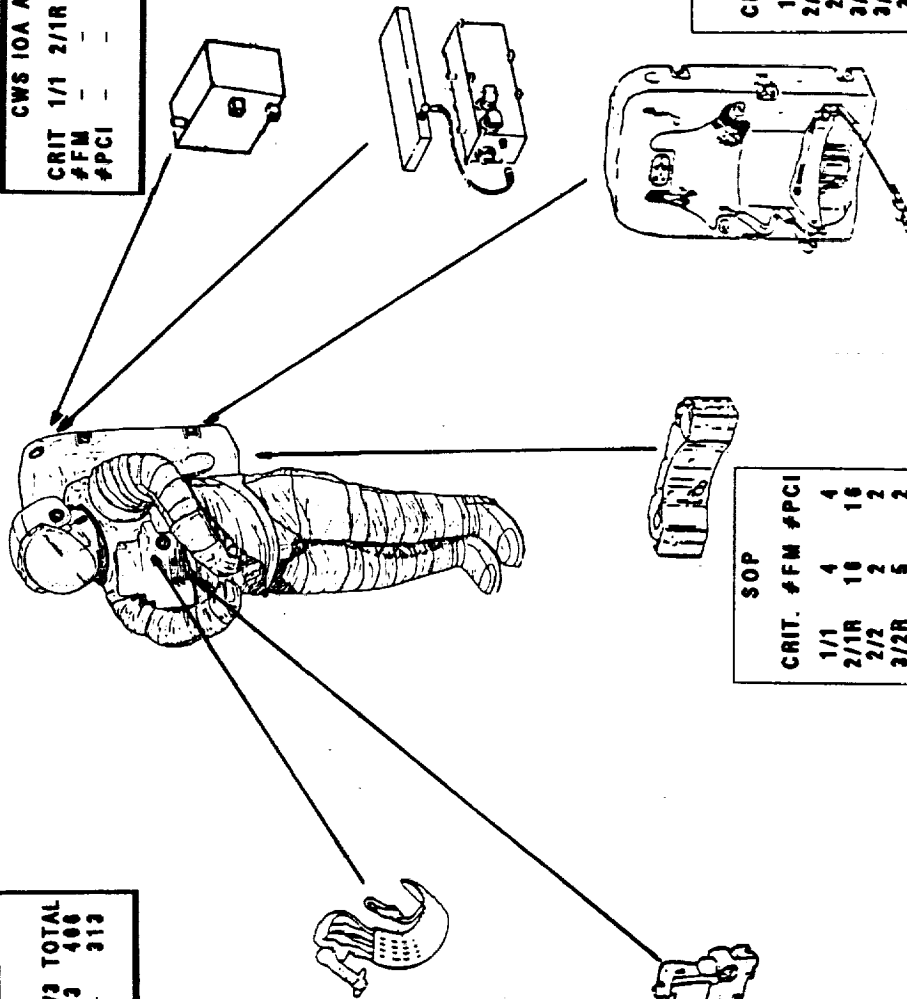


Figure 1 - LSS AND CWS ANALYSIS SUMMARY

EMU IOA ANALYSIS SUMMARY						
CRIT	1/1	2/1R	2/2	3/1R	3/2R	3/3 TOTAL
#FM	11	219	123	14	95	497
#PCI	11	219	123	13	24	390

SSA IOA ANALYSIS SUMMARY						
CRIT	1/1	2/1R	2/2	3/1R	3/2R	3/3 TOTAL
#FM	4	32	34	-	2	16 82
#PCI	4	32	34	-	-	76

ARMS			
CRIT.	#FM	#PCI	
1/1	1	1	
2/1R	5	5	
2/2	4	4	

HUT			
CRIT.	#FM	#PCI	
1/1	3	3	
2/1R	8	8	
2/2	7	7	
3/2R	2	-	
3/3	10	-	

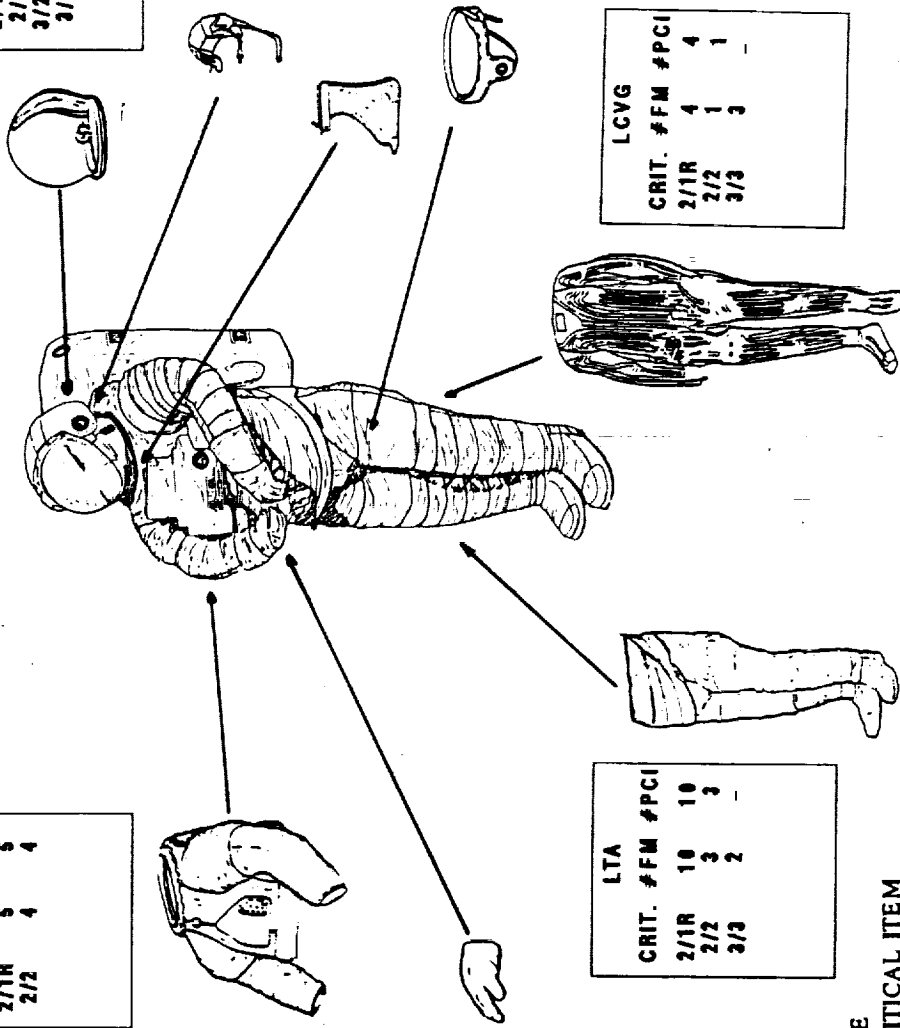
GLOVES			
CRIT.	#FM	#PCI	
2/1R	3	3	
2/2	6	6	

HELMET			
CRIT.	#FM	#PCI	
2/1R	2	2	
2/2	3	3	
3/2R	1	-	
3/3	1	-	

IDB - UCD - CCA			
CRIT.	#FM	#PCI	
2/2	10	10	
3/2R	1	-	

LCVG			
CRIT.	#FM	#PCI	
2/1R	4	4	
2/2	1	1	
3/3	3	-	

LTA			
CRIT.	#FM	#PCI	
2/1R	10	10	
2/2	3	3	
3/3	2	-	



CRIT - CRITICALITY
 FM - FAILURE MODE
 PCI - POTENTIAL CRITICAL ITEM

Figure 2 - SSA ANALYSIS SUMMARY

2.0 INTRODUCTION

2.1 Purpose

The 51-L Challenger accident prompted the NASA to readdress safety policies, concepts, and rationale being used in the National Space Transportation System (NSTS). The NSTS Office has undertaken the task of reevaluating the FMEA/CIL for the Space Shuttle design. The MDAC is providing an independent assessment of the Orbiter FMEA/CIL for completeness and technical accuracy.

2.2 Scope

The scope of the independent FMEA/CIL assessment activity encompasses those Shuttle Orbiter subsystems and GFE hardware identified in the Space Shuttle Independent FMEA/CIL Assessment Contractor Statement of Work. Each subsystem analysis addresses hardware, functions, internal and external interfaces, and operational requirements for all mission phases.

2.3 Analysis Approach

The independent analysis approach is a top-down analysis utilizing as-built drawings to breakdown the respective subsystem into components and low-level hardware items. Each hardware item is evaluated for failure mode, effects, and criticality. These data are documented in the respective subsystem analysis report, and are used to assess the NASA and Prime Contractor FMEA/CIL reevaluation results. The IOA analysis approach is summarized in the following Steps 1.0 through 3.0. Step 4.0 summarizes the assessment of the NASA and Prime Contractor FMEAs/CILs that is performed and documented at a later date.

Step 1.0 Subsystem familiarization

- 1.1 Define subsystem functions
- 1.2 Define subsystem components
- 1.3 Define subsystem specific ground rules and assumptions

Step 2.0 Define subsystem analysis diagram

- 2.1 Define subsystem
- 2.2 Define major assemblies
- 2.3 Develop detailed subsystem representations

Step 3.0 Failure events definition

- 3.1 Construct matrix of failure modes
- 3.2 Document IOA analysis results

Step 4.0 Compare IOA analysis data to NASA FMEA/CIL

- 4.1 Resolve differences
- 4.2 Review in-house
- 4.3 Document assessment issues
- 4.4 Forward findings to Project Manager

2.4 EMU Ground Rules and Assumptions

Due to the unique functions performed by the EMU, the IOA project determined it necessary to establish ground rules and assumptions specifically applicable to the EMU (reference Appendix B). These ground rules and assumptions, in addition to those established project wide (also provided in Appendix B), are intended to both complement and supplement those defined in NSTS 22206. Additional, they ensure that the IOA EMU analysis is capable of being understood by personnel who did not directly participate in the analysis.

3.0 SYSTEM DESCRIPTION

3.1 Design and Function

The Extravehicular Mobility Unit (EMU) is an independent anthropomorphic system that provides environmental protection, mobility, life support, and communications for the Space Shuttle crewmember to perform Extravehicular Activity (EVA) in Earth orbit. EVA has been defined for EMU analysis considerations as any time the EMU external environment pressure is below 4.0 psia. A schematic of the EMU is provided in Figure 3.

The EMU has been designed to accommodate an EVA mission with a total duration of 7 hours maximum, consisting of 15 minutes for egress, 6 hours for useful EVA tasks, 15 minutes for ingress, and a 30 minute reserve.

The EMU primarily consists of the Life Support System (LSS), Space Suite Assembly (SSA), and the Caution and Warning System (C&W).

1. Life Support Subsystem (LSS) - The LSS subsystem provides the following for the suited crewmember:
 - a. Pressurization
 - b. Thermal control
 - c. Breathing oxygen
 - d. Display and control of critical system parameters
 - e. Humidity, odor, and contaminant control
 - f. Electrical power storage and distribution
 - g. Communications

The assemblies and hardware which make up the LSS are described below.

- o The Primary Life Support Subsystem (PLSS), reference Figure 4, is an assembly which normally provides the crewmember with oxygen for breathing, ventilation, and pressurization and water for cooling. Additionally, with respect to the IOA analysis, the PLSS provides for the storage and distribution of power throughout the EMU and for the maintenance of the suit atmosphere.

The PLSS consists of oxygen bottles and water tanks together with associated regulators, relief valves, and plumbing. Also contained within the PLSS are a water pump, an air circulation fan, a sublimator used for water cooling, and a water separator used to remove excess moisture from the ventilation lines. Integral to the PLSS are several sensors used by the Caution and Warning System (CWS) in monitoring life support subsystem function.

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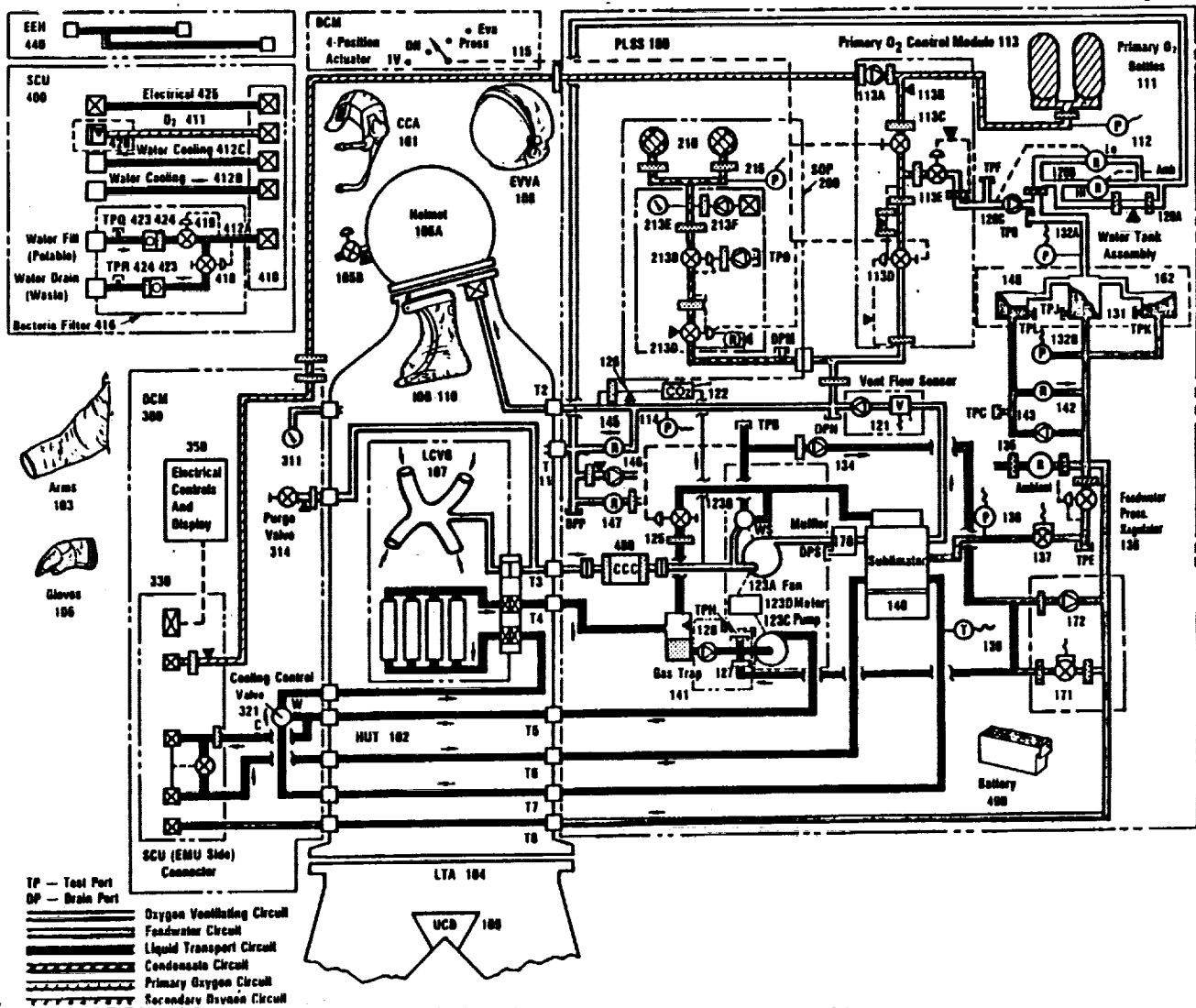


Figure 3 - EMU FUNCTIONAL SCHEMATIC

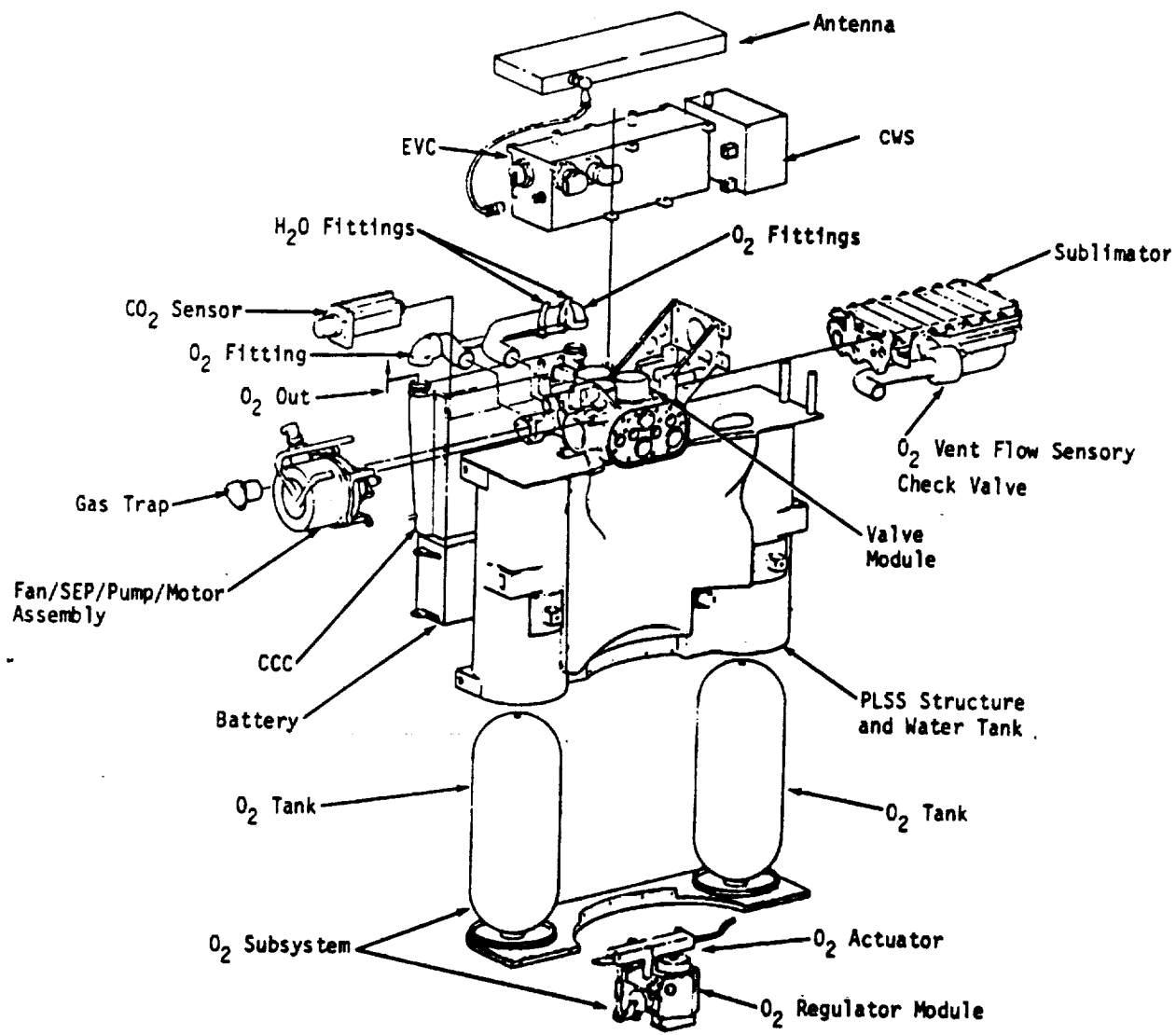


Figure 4 - PLSS, EVCS, AND CWS

Within the PLSS, the Contaminant Control Cartridge (CCC) contains an activated charcoal bed for trace gas removal, a LiOH bed for CO₂ removal, and a particulate filter to remove solid particles. The CCC is installed in the back of the PLSS and is replaceable in flight for EMU recharge.

EMU mission power requirements during EVA are satisfied by the PLSS battery which stores and provides the electrical power for the operation of all electric components of the EMU, reference Figure 5. The battery mounts into the back of the PLSS, is replaceable in flight, and can be recharged while installed in the PLSS.

- o The Secondary Oxygen Pack (SOP), reference Figure 6, is a functionally independent life support system, providing the EMU with an emergency back-up oxygen system for a minimum of 30 minutes. It provides oxygen for suit loop backup pressure regulation and an open loop oxygen purge for removal of heat, CO₂, and humidity in the event of a loss of the primary function. The SOP is mounted to the bottom of the PLSS and employs the same oxygen delivery path as the PLSS. Due to the numerous critical functions supported by the SOP, its operation and hardware are discussed in detail in the following paragraphs.

The SOP assembly contains two oxygen storage pressure vessels, a two stage regulator, a dial-type pressure gauge, a pressure transducer, and an oxygen fill connector (for servicing the SOP through Ground Servicing Equipment only).

Oxygen from the SOP is controlled by a two-stage regulator. The second-stage regulator also acts as the shutoff valve for this system. The second-stage regulator is caged when the oxygen actuator is in the OFF, IV, and PRESS positions. When the oxygen actuator is placed in the EVA position, the second-stage regulator is uncaged and oxygen is allowed to flow as demanded. The second-stage regulator also has a manual override that provides for crewmember checkout of the SOP during Pre-EVA operations.

The first-stage regulator reduces the nominal supply pressure of approximately 6000 psig to an interstage pressure of 240 to 280 psig. The second-stage regulator further reduces the interstage pressure to maintain the ventilation loop at

3.33 to 3.55 psid over a flow range of 4.51 to 5.26 lb/hr, 3.33 to 3.9 psid over 1.01 to 4.5 lb/hr, and 3.4 to 3.9 psid over 0.06 to 1 lb/hr.

If the second-stage regulator fails open, the outlet of the regulator acts as a flow-limiting orifice, limiting flow to 7.49 lb/hr, allowing the suit relief valve to maintain suit pressure. The second-stage regulator is designed to maintain suit pressure with an upstream pressure equal to full tank pressure.

Initiation of the SOP pressure make-up requires no action by the crewmember. The SOP purge is used to deliver oxygen or to remove CO₂, heat, and humidity from the system and is initiated by the crewmember manually opening the DCM purge valve. In this manner, suit pressure is controlled to 3.33 to 3.9 psid and a maximum oxygen flow of 4.9 lb/hr is delivered from the SOP through the helmet over the body, and then overboard via the purge valve to remove CO₂, heat, and humidity. A back-flow check valve in the PLSS ventilation duct helps direct all flow to the helmet.

If the purge is initiated by the crewmember opening the helmet purge valve on the helmet. Suit pressure is controlled from 3.33 to 3.9 psid and a flow of 2.5 lb/hr is delivered through the helmet. Flow in this mode is into the helmet through the vent pad, over and around the crewmember's head, and then out through the helmet purge valve; no cooling is provided.

- o DCM - The Displays and Controls Module (Figure 7) contains the visual displays and electrical and mechanical controls required for operation of the EMU by the EVA crewmember. Contained in the DCM are the cooling control valve, the suite pressure gauge, a purge valve, the SCU interface connector, a significant portion of the EMU electrical control electronics and switches, and the remote actuator for oxygen regulators. The DCM mounts directly to the front of the HUT.
- o SCU - The Service and Cooling Umbilical is a 12-ft umbilical that consists of three water hoses, a high-pressure oxygen hose, electrical wiring and bacteria filters. The SCU supplies the PLSS with electrical power, communications, oxygen, waste water drainage, and water cooling from the Orbiter during pre- and post-EVA operations. It also supplies the EMU with recharge of the oxygen tanks, water tanks, and battery.

The vehicle end of the SCU consists of four ECLSS connections and one electrical connector that connects the SCU to the Orbiter service panel. The connections are permanent and do not require crewmember operation.

The common connector on the EMU end of the SCU combines the four fluid and one electrical circuit connector into a single connector operated by the crewmember.

- o EVCS - The EMU radio is a UHF/AM transceiver installed within the PLSS (reference Figure 4). It provides the following basic functions.
 - o Duplex voice communications with another EVA crewmember and the Orbiter
 - o Biomedical (ECG) Telemetry via a subcarrier
 - o A backup communications mode that provides simplex voice-only communications between the Orbiter and EVA crewmembers

Additionally, the radio provides audible caution and warning tones when cued by the CWS to alert the crewmember in the event of abnormal or unsafe conditions.

The low profile, omnidirectional UHF antenna is mounted in a pocket of the thermal cover on top of the PLSS. It consists of three resonating cavity antennas, one for each of the frequencies used.

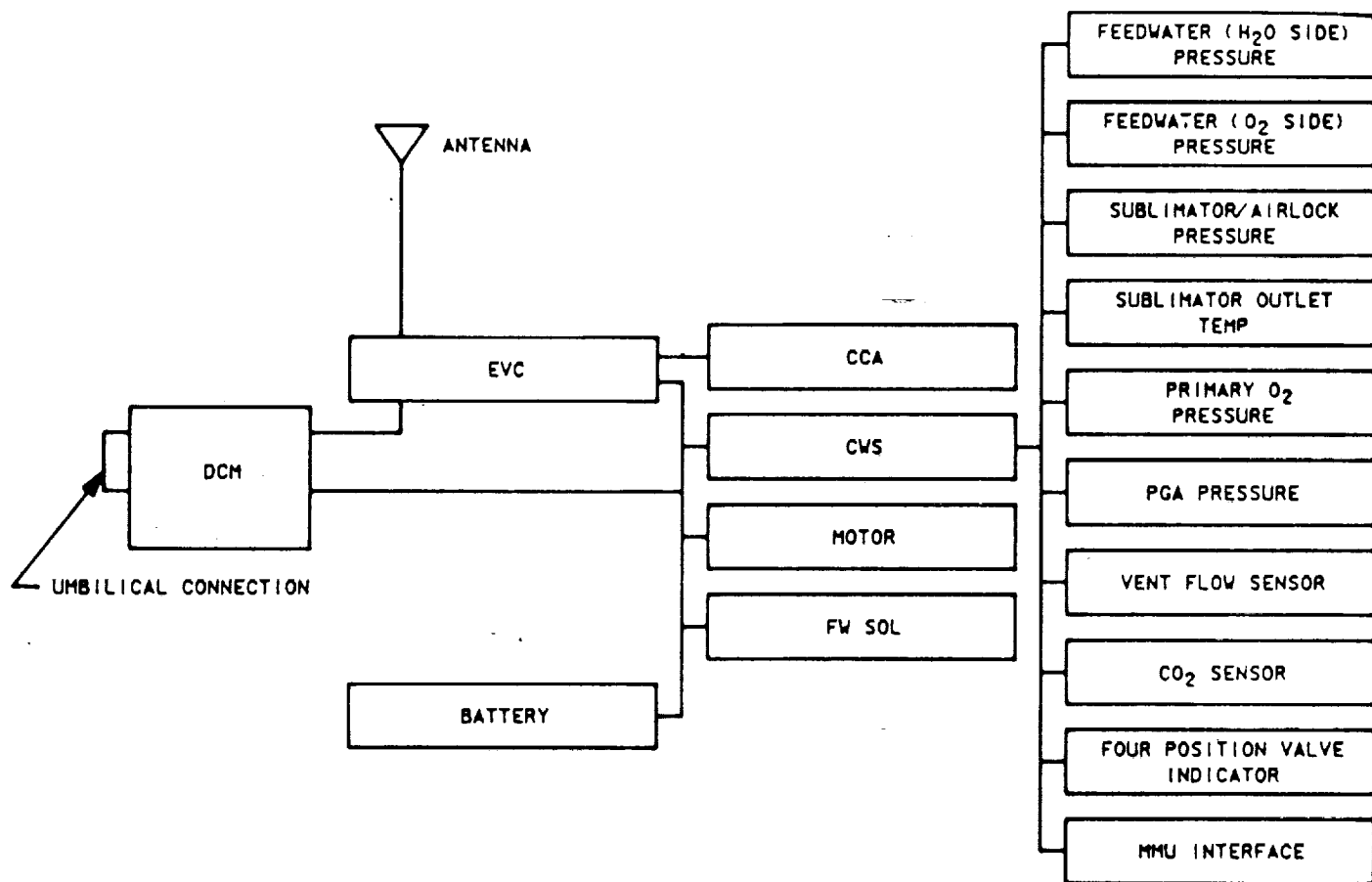


Figure 5 - EMU ELECTRICAL INTERFACES

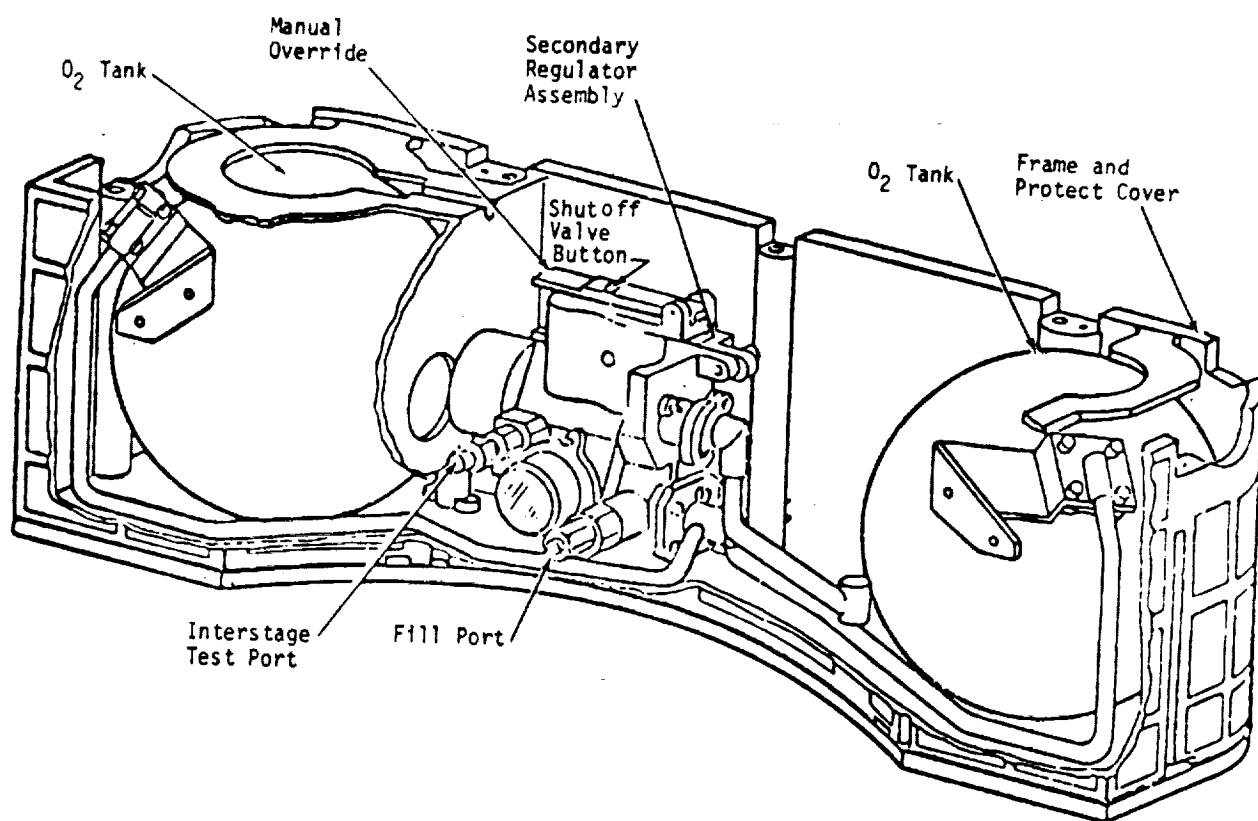


Figure 6 - SOP

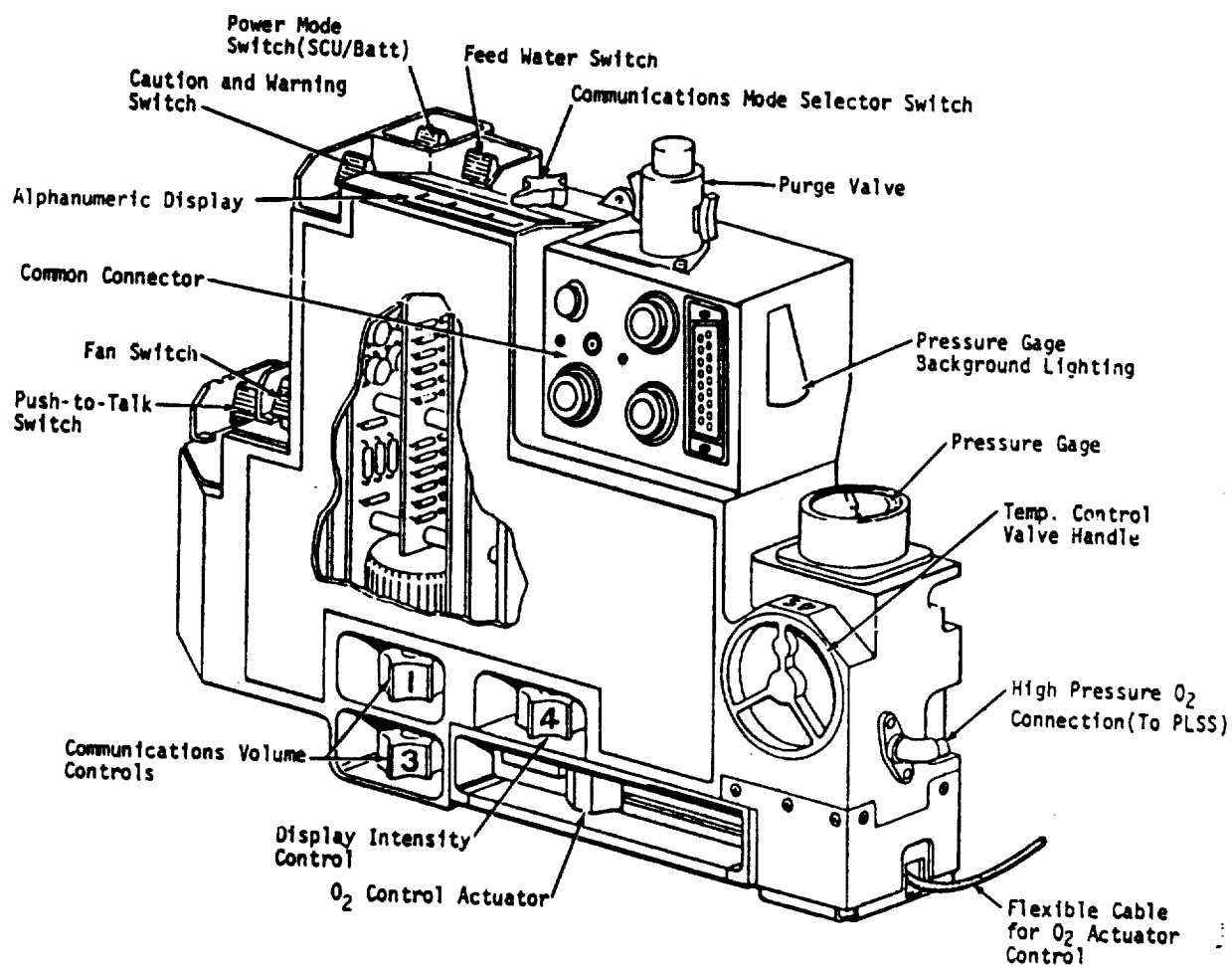


Figure 7 - DCM

2. Space Suit Assembly (SSA) - The SSA, reference Figure 8, provides crewmember enclosure for all EVA operations. Containment of the pressurized environment, ventilation and cooling loop support, crewmember mobility and crewmember visibility are the primary functions provided by the SSA. The assemblies and components comprising the SSA are discussed in the following paragraphs.
- o HUT and Arms: The hard upper torso includes provisions for the attachment of the helmet/visor, arms, lower torso, PLSS, and DCM. The upper torso consists of a hard torso section, the upper half of the waist ring, the lower half of the helmet neck ring, and the TMG. Integral to the upper torso structure is the channeling for both cooling water circulation and ventilation oxygen circulation. Each arm consists of an upper arm and a lower arm connected by the arm bearing. The upper arm includes the upper torso interfacing scye bearing, a shoulder joint, a conformal bladder, and a TMG. The lower arm includes the glove interfacing wrist disconnect, an elbow joint, a conformal bladder, and a TMG.
 - o LTA: The lower torso assembly provides coverage for the crewmember from the waist down. It includes a waist bearing, waist section, legs, boots, boot soles, fabric restraint, bladder, and TMG. The top of the lower torso is the lower half of the waist ring, which provides space suit assembly separation for donning, doffing and support for the waist section and hip joints. The redundant axial restraint system transmits loads through all joints from the boots to the lower half of the waist ring.
 - o Gloves: The EV glove provides protection from both vacuum and temperature extremes for the crewmember's hand. A conformal urethane bladder provides pressure integrity while a polyester cloth restraint system keeps the bladder from deforming when pressurized. A multi-layer insulation (MLI) thermal blanket covers the bladder/restraint system with an Ortho fabric outer layer over the MLI. An adjustable plam restraint bar enables the crewmember to tighten the glove palm area as required for hand mobility.
 - o Helmet/Visor Assembly: The helmet/visor consists of the helmet bubble and the visor assembly, which are permanently attached. The bubble is a clear rigid pressure-retaining vessel made from UV-stabilized polycarbonate material. Integral to



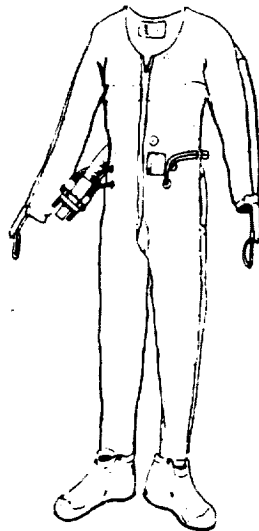
IN-SUIT DRINK
BAG

COMMUNICATIONS
CARRIER
ASSEMBLY

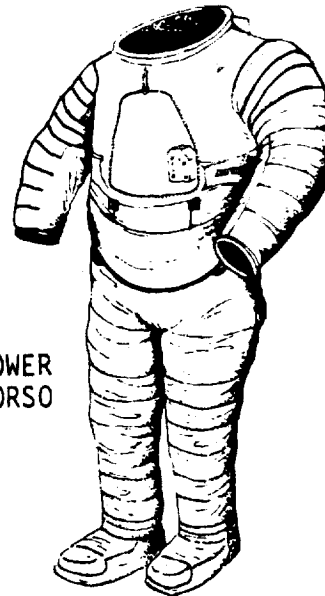


HELMET/VISOR
ASSEMBLY

LIQUID COOLING
GARMENT



UPPER
TORSO



LOWER
TORSO



UCD



GLOVES

Figure 8 - SSA

the helmet bubble are the helmet neck ring, which attaches to the upper torso neck ring, and the vent pad, which directs the oxygen flow to the helmet over the crewmember's face for effective carbon dioxide removal. The helmet purge valve is located on the left side of the helmet.

The visor assembly protects the crewmember and helmet from thermal and solar radiation. It consists of visors, pivot and latch mechanisms, center and side eyeshades, and supporting structures for the visors and the shades. The visors are fabricated from UV-stabilized polycarbonate and polysulfane material with thermal/optical coatings applied to the inner surface.

- o LCVG: The cooling garment is a form-fitting elastic garment worn against the crewmember's body. The garment supports a network of tubing that circulates cooling water over the body. It also supports a network of ducting that draws ventilating gas from suit extremities to complete the suit ventilation loop. Connections to the ducting in the HUT for both cooling water and vent flows are made at the multiple connector.
 - o CCA: The comm cap is a fabric skull cap encapsulating microphone and earphone electronic modules.
 - o UCD: The male UCD is a rubberized fabric bladder worn inside the cooling garment around the waist with a roll-on cuff for interfacing with the crewmember. Urine contained in the UCD may be dumped into the urine tube of the Waste Collection System (WCS). The UCD can contain a maximum of 32 fluid ounces of urine.
3. Caution and Warning System (CWS) - The EMU caution and warning system monitors system configuration, environmental parameters, and consumables status. When detected, faults are displayed to the crewmember automatically. The crewmember can display suit parameters and consumables status at any time. The Shuttle EMU is independent of ground monitoring and control.

The CWS microprocessor is the heart of the EMU CWS and is located on the top side of the PLSS. This box contains the central processing unit, the memory, the analog to digital converters, and the latching relays necessary to processing incoming sensor information and providing it to the crewmember.

3.2 Interfaces and Locations

The EMU interfaces with the Shuttle Orbiter airlock, its mission equipment provisions, and the MMU.

The Orbiter airlock provides stowage for the EMU during launch, orbit, and reentry by means of the EMU mount. The EMU mount serves as the EMU donning and doffing station during EVA preparation and post-EVA operations in the airlock. During EVA prep and post activities, the EMU is connected to the Orbiter Environmental Control and Life Support Subsystem (ECLSS) in the airlock by the SCU for airlock-supplied oxygen, cooling water, communications, and power. Before a second EVA, the EMU is connected to the Orbiter ECLSS by the SCU for EMU recharge. During recharge, the EMU is stowed in the airlock on the EMU mount which serves as a recharge station to permit simultaneous water and oxygen charging, LiOH cartridge replacement, and battery charging or replacement.

The EMU interfaces with crewmember restraint and translation provisions in the airlock and cargo bay. These provisions include handholds, handrails, foot restraints, and tether attachment points.

The Manned Maneuvering Unit (MMU) provides the EVA crewmember a free space maneuvering capability outside the Orbiter cargo bay. The EMU latches to the MMU with the passive half of the latching device provided by the PLSS. The MMU contains the active half of the latching mechanism. Additionally, the MMU support station provides restraints and handrails to aid the EVA crewmember in donning and doffing the MMU.

3.3 Hierarchy

Due to the approach employed by the IOA, the EMU system was analyzed in a hierarchal manner to ensure consistency in fault path definition and in the identification of failure effects. The top level hierarchy employed for EMU analysis considerations is presented in Figure 9.

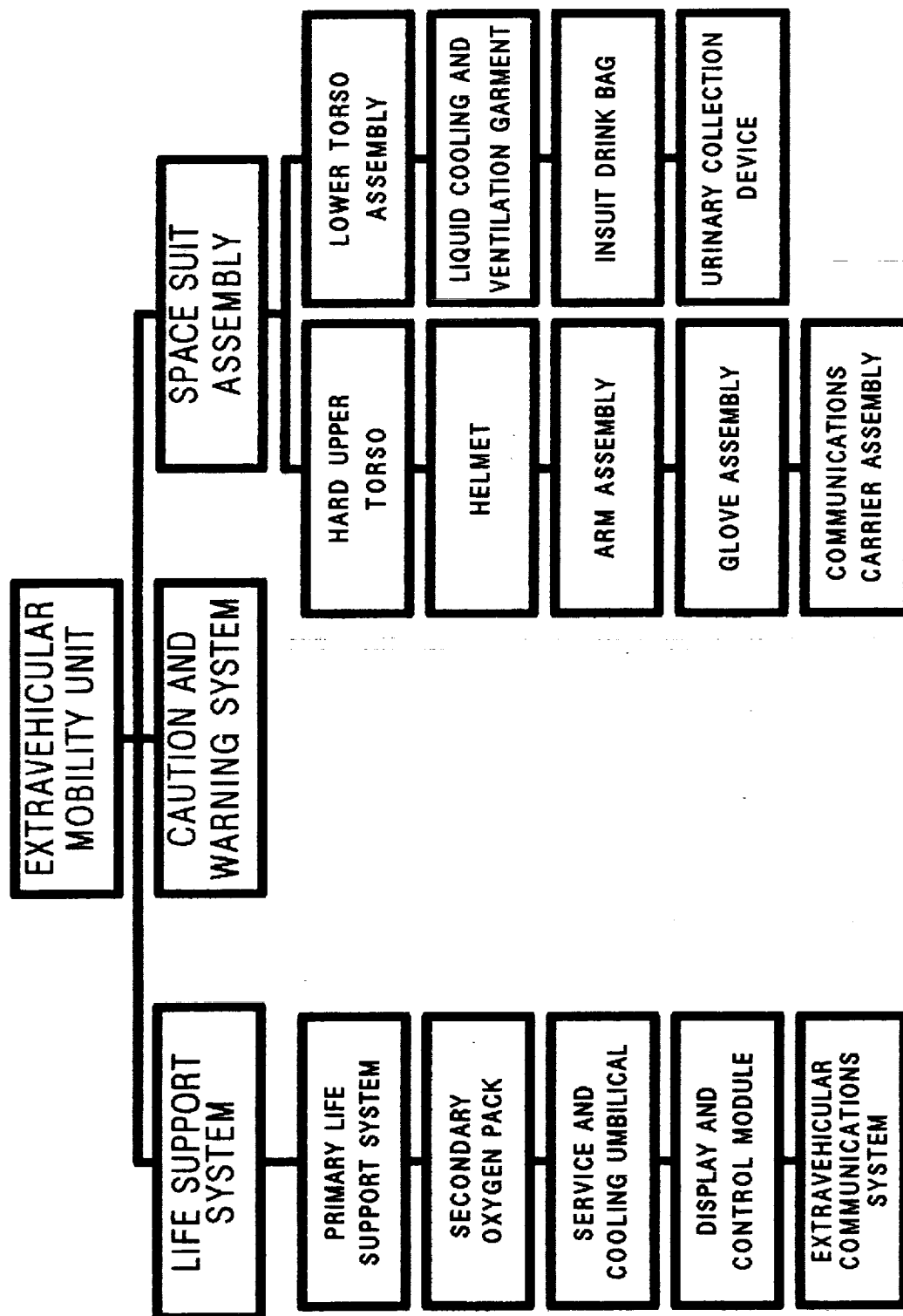


Figure 9 - EMU HIERARCHY

4.0 ANALYSIS RESULTS

The IOA analysis of the EMU resulted in the identification of 497 failure modes (reference Appendix C) from which 390 PCIs (reference Appendix D) were derived. The summary distributions of failure criticalities and their corresponding PCIs are provided in Tables I and II, respectively.

TABLE I Summary of IOA Failure Modes and Criticalities							
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	3/3	TOTAL
LSS (Total)	7	187	82	14	93	23	406
PLSS	2	135	28	9	12	12	198
SOP	4	16	2	-	5	1	28
SCU	-	2	5	-	27	1	35
DCM	1	34	47	5	40	9	136
EVCS	-	-	-	-	9	-	9
C & W	-	-	7	-	-	2	9
SSA (Total)	4	32	34	-	2	10	82
HUT	3	8	7	-	-	2	20
Helmet	-	2	3	-	1	1	7
Arms	1	5	4	-	-	-	10
Gloves	-	3	6	-	-	-	9
LTA	-	10	3	-	-	2	15
LCVG	-	4	1	-	-	3	8
IDB	-	-	4	-	-	2	6
UCD	-	-	5	-	-	-	5
CCA	-	-	1	-	1	-	2
TOTAL	11	219	123	14	95	35	497

TABLE II Summary of IOA Potential Critical Items						
Criticality:	1/1	2/1R	2/2	3/1R	3/2R	TOTAL
LSS (Total)	7	187	82	13	24	313
PLSS	2	135	28	9	6	180
SOP	4	16	2	-	2	24
SCU	-	2	5	-	8	15
DCM	1	34	47	4	8	94
EVCS	-	-	-	-	-	-
C & W	-	-	7	-	-	7
SSA (Total)	4	32	34	-	-	70
HUT	3	8	7	-	-	18
Helmet	-	2	3	-	-	5
Arms	1	5	4	-	-	10
Gloves	-	3	6	-	-	9
LTA	-	10	3	-	-	13
LCVG	-	4	1	-	-	5
IDB	-	-	4	-	-	4
UCD	-	-	5	-	-	5
CCA	-	-	1	-	-	1
TOTAL	11	219	123	13	24	390

As is evident, the failure mode and PCI distributions were generally dependent upon hardware complexity and the number of primary functions supported or impacted. These distributions are discussed in detail in the following paragraphs.

4.1 Analysis Results - PLSS

The PLSS analysis identified one hundred and ninety-eight (198) failure modes applicable to its various components and assemblies. Of this number, 90.9% were determined to be PCIs. The two most critical failure modes can result in immediate loss of the crewperson due to an oxygen fire or shrapnel. Because the SOP (discussed in paragraph 4.2) provides redundancy for many of the PLSS functions, one hundred and thirty-five (135) of the 163 mission impact PCI failure modes could be elevated to a possible loss of life if the SOP functions were also failed.

No simple breakdown of failure modes per function was identified; however, during the analysis, the dependency placed upon the SOP by the system design became quite evident. With the exception of the two aforementioned life critical PCI failure modes and twelve failure modes which do not impact PLSS operation in any critical manner, the large majority of the remaining 184 failure modes require unimpaired SOP operation to ensure crewperson survival.

4.2 Analysis Results - SOP

Four single point failures within the SOP can result in loss of crewperson due to an oxygen fire or shrapnel release. Eighteen failure modes can result in mission impact and sixteen of these, given a failure of a non-SOP primary function, can also result in loss of crewperson. The majority of the aforementioned mission impact failure modes typically result in the loss or degradation of the SOP function. When an additional five failure modes (each resulting in mission impact only after an earlier failure) are accounted for and redundancy screens assessed, the total number of PCIs determined within the SOP is twenty-four (24).

4.3 Analysis Results - SCU

Within the analysis the SCU was considered an integral element to several EMU functions (e.g. oxygen delivery, cooling, and environmental maintenance). As such, seven failure modes were identified which, if detected, would result in mission termination; additionally, two of these could result in loss of crewperson during an EVA if a redundant function is also lost. Another twenty-seven failure modes identified were determined capable of impact to the mission with a corresponding loss of redundancy and, of these, only eight failed one or more redundancy screens.

4.4 Analysis Results - DCM

The failure of the DCM pressure gage bourdon tube in a violent manner (ruptures causing an oxygen fire) is the sole DCM PCI which can result in immediate loss of the crewperson. The

remaining DCM PCI failure modes (a total of 93) typically either result in mission impacts or, when combined with loss of redundancy, loss of crewperson or mission. Eighty-one PCIs exist which, if any one occurs, could result in mission termination; however, if combined with corresponding loss of redundant function(s), thirty-four of these could cause the loss of a crewperson. Additionally, a large number of these 81 PCIs result in the inability of the DCM to support either EMU recharge or EMU systems management operations. An additional forty-five (45) failure modes exist which have no impact unless accompanied by loss of redundancy. Of these, five can result in loss of crewperson and forty can result in loss of mission - these often split between loss of EMU recharge or systems management. Application of redundancy screens to these forty-five failure modes result in only 12 being considered PCIs.

4.5 Analysis Results - EVCS

Being the EVCS design provides redundant transmission and reception capabilities no life threatening or mission critical failure modes were identified. However, of the nine failure modes identified, all were considered capable of causing mission termination when loss of redundant EVCS functions were considered. Because all nine of these passed their redundancy screens, none were considered as a PCI.

4.6 Analysis Results - Caution and Warning

Nine failure modes, seven of which are PCIs, can exist in the EMU caution and warning subsystem. The seven PCI failure modes all would result in mission termination either due to erroneous information being provided the crewperson or due to loss of insight into EMU systems operation,.

4.7 Analysis Results - HUT

Twenty failure modes were identified applicable to the HUT; eighteen of which are PCIs. The three most critical PCI failure modes result in loss of crewperson due to a gross failure of a HUT interface thereby causing loss of EMU pressure integrity beyond the capability of the SOP. The remaining fifteen PCI failure modes result in mission impact. When eight of these are combined with a corresponding loss of a redundant function - quite often one supported by the SOP, loss of crewperson could result. The other seven PCI failure modes all result in the inability of the HUT to support mission donning/configuration requirements (e.g. unable to mate the helmet to HUT).

4.8 Analysis Results - Helmet

Seven failure modes applicable to the helmet resulted in five PCIs being identified. Each PCI failure mode results in a mission impact. Two of these, if accompanied by a corresponding loss of redundant functions, can also result in loss of crewperson due to loss of pressurization.

4.9 Analysis Results - Arms

Every failure mode (10) applicable to the arms resulted in a PCI. One failure mode could cause loss of a crewperson (by gross depressurization) while the remaining nine would be an immediate mission impact - typically either by loss of mobility, pressure integrity, or don/doff capability. Additionally, the five failure modes which cause degradation or loss of pressure integrity can cause loss of a crewperson if the redundant pressure integrity functions are correspondingly lost.

4.10 Analysis Results - Gloves

The gloves contain nine failure modes and PCIs - all mission impacts. As with the arms, three failure modes, involving loss of degradation of pressure integrity, can result in crewperson loss with loss of redundancies. The remaining PCI failure modes impact the mission by degradation of glove mobility or function during don/doff.

4.11 Analysis Results - LTA

The failure modes applicable to the LTS are similar to those applicable to the HUT and arms. Fifteen failure modes were identified as applicable to the LTS and, upon analysis, thirteen were considered PCIs. None could result in immediate loss of crewperson without corresponding loss of redundant elements; ten of these exist.

4.12 Analysis Results - LCVG

Analysis of the LCVG identified five PCIs. All five result in mission impact and, except for one, can result in loss of crewperson with corresponding loss of redundancy. Those four which can cause loss of crewperson typically cause degradation or loss of the LCVG ventilation or cooling functions.

4.13 Analysis Results - IDB, UCD, and CCA

None of the failures identified as applicable to the IDB, UCD, and CCA are capable of causing loss of life; however, ten (all of which are PCIs) are capable of causing mission termination. Nine IDB and UCD PCI failure modes impact the mission by reducing crewperson comfort and impairment of performance - typically by reduced mobility or vision. The CCA PCI failure mode causes loss of communications and, therefore, the mission.

5.0 REFERENCES

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APPENDIX A
ACRONYMS

AAP	Airlock Adapter Plate
BITE	Built-in Test Equipment
CCA	Communications Carrier Assembly
CCC	Contaminant Control Cartridge
COMM	Communication
CPU	Central Processing Unit
CWS	Caution and Warning System
C&W	Caution and Warning
DCM	Display and Control Module
EVCS	Extravehicular Communications System
ECLSS	Environmental Control and Life Support System
EMU	Extravehicular Activity
EVA	Extravehicular Activity
EVC	Extravehicular Communicator
EVVA	Extravehicular Visor Assembly
EVCS	Extravehicular Communications System
FM	Failure Mode
GFE	Government Furnished Equipment
HSD	Hamilton Standard
HUT	Hard Upper Torso
IOA	Independent Orbiter Assessment
IDB	Insuit Drink Bag
IVA	Intravehicular Activity
LCVG	Liquid Cooling and Vent Garment
LiOH	Lithium Hydroxide
LSS	Life Support System
LTA	Lower Torso Assembly
MMU	Manned Maneuvering Unit
OPS	Operations
PLSS	Primary Life Support Subsystem
SCU	Service and Cooling Umbilical
SOP	Secondary Oxygen Pack
SSA	Space Suite Assembly
STS	Space Transportation System
UCD	Urine Collection Device

APPENDIX B

DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

- B.1 Definitions
- B.2 Project Level Ground Rules and Assumptions
- B.3 Subsystem-Specific Ground Rules and Assumptions

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APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.1 Definitions

Definitions contained in NSTS 22206, Instructions For Preparation of FMEA/CIL, 10 October 1986, were used with the following amplifications and additions.

INTACT ABORT DEFINITIONS:

RTLS - begins at transition to OPS 6 and ends at transition to OPS 9, post-flight

TAL - begins at declaration of the abort and ends at transition to OPS 9, post-flight

AOA - begins at declaration of the abort and ends at transition to OPS 9, post-flight

ATO - begins at declaration of the abort and ends at transition to OPS 9, post-flight

CREDIBLE (CAUSE) - an event that can be predicted or expected in anticipated operational environmental conditions. Excludes an event where multiple failures must first occur to result in environmental extremes

CONTINGENCY CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

EARLY MISSION TERMINATION - termination of onorbit phase prior to planned end of mission

EFFECTS/RATIONALE - description of the case which generated the highest criticality

HIGHEST CRITICALITY - the highest functional criticality determined in the phase-by-phase analysis

MAJOR MODE (MM) - major sub-mode of software operational sequence (OPS)

MC - Memory Configuration of Primary Avionics Software System (PASS)

MISSION - assigned performance of a specific Orbiter flight with payload/objective accomplishments including orbit phasing and altitude (excludes secondary payloads such as GAS cans, middeck P/L, etc.)

MULTIPLE ORDER FAILURE - describes the failure due to a single cause or event of all units which perform a necessary (critical) function

OFF-NOMINAL CREW PROCEDURES - procedures that are utilized beyond the standard malfunction procedures, pocket checklists, and cue cards

OPS - software operational sequence

PRIMARY MISSION OBJECTIVES - worst case primary mission objectives are equal to mission objectives

PHASE DEFINITIONS:

PRELAUNCH PHASE - begins at launch count-down Orbiter power-up and ends at moding to OPS Major Mode 102 (liftoff)

LIFTOFF MISSION PHASE - begins at SRB ignition (MM 102) and ends at transition out of OPS 1 (Synonymous with ASCENT)

ONORBIT PHASE - begins at transition to OPS 2 or OPS 8 and ends at transition out of OPS 2 or OPS 8

DEORBIT PHASE - begins at transition to OPS Major Mode 301 and ends at first main landing gear touchdown

LANDING/SAFING PHASE - begins at first main gear touchdown and ends with the completion of post-landing safing operations

APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.2 IOA Project Level Ground Rules and Assumptions

The philosophy embodied in NSTS 22206, Instructions for Preparation of FMEA/CIL, 10 October 1986, was employed with the following amplifications and additions.

1. The operational flight software is an accurate implementation of the Flight System Software Requirements (FSSRs).

RATIONALE: Software verification is out-of-scope of this task.

2. After liftoff, any parameter which is monitored by system management (SM) or which drives any part of the Caution and Warning System (C&W) will support passage of Redundancy Screen B for its corresponding hardware item.

RATIONALE: Analysis of on-board parameter availability and/or the actual monitoring by the crew is beyond the scope of this task.

3. Any data employed with flight software is assumed to be functional for the specific vehicle and specific mission being flown.

RATIONALE: Mission data verification is out-of-scope of this task.

4. All hardware (including firmware) is manufactured and assembled to the design specifications/drawings.

RATIONALE: Acceptance and verification testing is designed to detect and identify problems before the item is approved for use.

5. All Flight Data File crew procedures will be assumed performed as written, and will not include human error in their performance.

RATIONALE: Failures caused by human operational error are out-of-scope of this task.

6. All hardware analyses will, as a minimum, be performed at the level of analysis existent within NASA/Prime Contractor Orbiter FMEA/CILs, and will be permitted to go to greater hardware detail levels but not lesser.

RATIONALE: Comparison of IOA analysis results with other analyses requires that both analyses be performed to a comparable level of detail.

7. Verification that a telemetry parameter is actually monitored during AOS by ground-based personnel is not required.

RATIONALE: Analysis of mission-dependent telemetry availability and/or the actual monitoring of applicable data by ground-based personnel is beyond the scope of this task.

8. The determination of criticalities per phase is based on the worst case effect of a failure for the phase being analyzed. The failure can occur in the phase being analyzed or in any previous phase, whichever produces the worst case effects for the phase of interest.

RATIONALE: Assigning phase criticalities ensures a thorough and complete analysis.

9. Analysis of wire harnesses, cables, and electrical connectors to determine if FMEAs are warranted will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

10. Analysis of welds or brazed joints that cannot be inspected will not be performed nor FMEAs assessed.

RATIONALE: Analysis was substantially complete prior to NSTS 22206 ground rule redirection.

11. Emergency system or hardware will include burst discs and will exclude the EMU Secondary Oxygen Pack (SOP), pressure relief valves and the landing gear pyrotechnics.

RATIONALE: Clarify definition of emergency systems to ensure consistency throughout IOA project.

APPENDIX B
DEFINITIONS, GROUND RULES, AND ASSUMPTIONS

B.3 EMU Ground Rules and Assumptions

1. The overall EMU mission will encompass both planned EVA operations (typically two 2-man EVAs are available each Orbiter mission) and unscheduled EVA operations (typically reserved for Orbiter safety-critical EVA tasks).

RATIONALE: Ensures analysis provides worst-case mission impact.

2. The inability of an EMU to perform an EVA or to satisfy a six-hour EVA duration will be considered a mission impact.

RATIONALE: A worst case scenario in which the EMU is employed for prebreathe, or in which the EVA is time critical (e.g. rescue of stranded EVA crewmember), or in which the EVA objectives require full EVA duration is thus obtained for the IOA analysis.

APPENDIX C
DETAILED ANALYSIS

This section contains the IOA analysis worksheets generated during the analysis of this subsystem. The information on these worksheets is intentionally similar to the NASA FMEAs. Each of these sheets identifies the hardware item being analyzed, and parent assembly, as well as the function. For each failure mode, the possible causes are outlined, and the assessed hardware and functional criticality for each mission phase is listed, as described in the NSTS 22206, Instructions for Preparation of FMEA and CIL, 10 October 1986. Finally, effects are entered at the bottom of each sheet, and the worst case criticality is entered at the top.

LEGEND FOR IOA ANALYSIS WORKSHEETS

Hardware Criticalities:

- 1 = Loss of life or vehicle
- 2 = Loss of mission or next failure of any redundant item (like or unlike) could cause loss of life/vehicle
- 3 = All others

Functional Criticalities:

- 1R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of life or vehicle.
- 2R = Redundant hardware items (like or unlike) all of which, if failed, could cause loss of mission.

Redundancy Screen A:

- 1 = Is Checked Out PreFlight
- 2 = Is Capable of Check Out PreFlight
- 3 = Not Capable of Check Out PreFlight
- NA = Not Applicable

Redundancy Screens B and C:

- P = Passed Screen
- F = Failed Screen
- NA = Not Applicable

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 100 FLIGHT: 2/1R

ITEM: PRIMARY H2O TANK 1 (ITEM 131)
FAILURE MODE: BLADDER FAILURE (02/H2O)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV769592-24

CAUSES: MATERIAL DEFECT, EXCESSIVE WEAR, BLADDER SEAL FAILURE

EFFECTS/RATIONALE:

02 AND H2O MIX IN FDW TANK DURING EVA WITH PROBABLE
DEGREDAATION/LOSS OF COOLING DUE TO INEFFICIENT H2O FLOW TO
SUBLIMATOR; THEREFORE, LOSS OF CREWPERSON IF SOP ALSO FAILS.
UNABLE TO OBTAIN HYRAULIC LOCK-UP DURING FILL/RECHARGE-WOULD LEAK
INTO THE GAS SIDE. EXCESS H2O USAGE DURING CHARGE WOULD INDICATE
LEAK. UNDETECTED, H2O ON THE GAS SIDE COULD MIGRATE (VIA THE
120A ORIFICE) TO THE SUIT WHERE IT WOULD THREATEN USE OF THE
PURGE VALVE BY H2O FREEZING AND BLOCKING IT DURING EVA WHEN LOSS
OF COOLING WOULD REQUIRE EMERGENCY SOP USE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 101 FLIGHT: 2/1R

ITEM: PRIMARY H2O TANK 1 (ITEM 131)
FAILURE MODE: LEAK-02 SIDE EXTERNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE, VIBRATION

EFFECTS/RATIONALE:

DURING PRE- AND POST-EVA, O2 SIDE IS NOT PRESSURIZED EXCEPT DURING PORTIONS OF DONNING AND DOFFING SEQUENCES. DURING EVA AND PRE- AND POST-EVA TIMEFRAMES WHEN O2 PRESSURIZATION EXISTS, LEAKAGE WOULD RESULT IN MISSION IMPACT AND LOSS OF PRIMARY O2 SUPPLY REQUIRING, IF EVA, SOP USAGE. LOSS OF SOP CAN RESULT IN LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 102 FLIGHT: 2/1R

ITEM: PRIMARY H2O TANK 1 (ITEM 131)
FAILURE MODE: LEAK-H2O SIDE, EXTERNAL (OR VIA TPJ)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE, CORROSION

EFFECTS/RATIONALE:

LOSS OF H2O RESULTS IN THE INABILITY TO OBTAIN ACCEPTABLE
FILL/RECHARGE AND THEREFORE LOSS OF MISSION. H2O LOSS DURING EVA
RESULTS IN LOSS/DEGRADATION OF COOLING VIA SUBLIMATOR WITH
POSSIBLE USAGE OF SOP REQUIRED TO RETURN CREWPERSON TO VEHICLE.
WITH LOSS OF SOP, POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 103 FLIGHT: 2/1R

ITEM: PRIMARY H2O TANK 1 (ITEM 162)
FAILURE MODE: BLADDER FAILURE (02/H2O)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769592-24

CAUSES: MATERIAL DEFECT, EXCESSIVE WEAR, BLADDER SEAL FAILURE

EFFECTS/RATIONALE:

02 AND H2O MIX IN FDW TANK. UNABLE TO OBTAIN HYDRAULIC LOCK-UP DURING FILL/RECHARGE. H2O WOULD LEAK INTO GAS SIDE AND EXCESS H2O USE WOULD INDICATE LEAK. UNDETECTED, THIS H2O ON THE GAS SIDE COULD MIGRATE (VIA THE 120A ORIFICE) TO THE SUIT WHERE IT WOULD THREATEN USE OF THE PURGE VALVE BY H2O FREEZING AND BLOCKING IT DURING EVA WHEN LOSS OF COOLING REQUIRES SOP USAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 104 FLIGHT: 2/1R

ITEM: PRIMARY H2O TANK 1 (ITEM 162)
FAILURE MODE: LEAK-02 SIDE, EXTERNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

DURING PRE- AND POST-EVA, O2 SIDE IS NOT PRESSURIZED EXCEPT DURING PORTIONS OF DONNING AND DOFFING SEQUENCES. DURING EVA, AND THESE PRE- AND POST-EVA TIMEFRAMES WHEN O2 PRESSURIZATION EXIST, LEAKAGE WOULD RESULT IN MISSION IMPACT AND LOSS OF PRIMARY O2 SUPPLY REQUIRING, IF EVA, SOP USAGE. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 105 FLIGHT: 2/1R

ITEM: PRIMARY H2O TANK 1 (ITEM 162)
FAILURE MODE: LEAK-H2O SIDE, EXTERNAL (AND/OR VIA TPK)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O RESULTS IN INABILITY TO PERFORM ACCEPTABLE
FILL/RECHARGE AND THEREFORE LOSS OF MISSION. H2O LOSS DURING EVA
RESULTS IN LOSS/DEGRADATION OF COOLING VIA SUBLIMATOR WITH
POSSIBLE REQUIRED USAGE OF SOP TO RETURN CREW PERSON TO VEHICLE.
IF THE SOP FAILS THE CREWPERSON COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 106 FLIGHT: 2/1R

ITEM: RESERVE H2O TANK (ITEM 148)
FAILURE MODE: BLADDER FAILURE (O2/H2O MIX)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV769592-24

CAUSES: MATERIAL DEFECT, EXCESSIVE WEAR, BLADDER SEAL FAILURE

EFFECTS/RATIONALE:

O2 AND H2O MIX IN FDW TANK. UNABLE TO OBTAIN HYDRAULIC LOCK-UP DURING FILL/RECHARGE-H2O THEN LEAK INTO THE GAS SIDE. EXCESS H2O FOR FILL WOULD INDICATE LEAK. UNDETECTED, THIS H2O ON THE GAS SIDE COULD MIGRATE (VIA THE 120A ORIFICE) TO THE SUIT WHERE IT WOULD THREATEN USE OF THE PURGE VALVE BY H2O FREEZING AND BLOCKING IT DURING EVA WHEN LOSS OF COOLING WOULD REQUIRE SOP USEAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 107 FLIGHT: 2/1R

ITEM: RESERVE H2O TANK (ITEM 148)
FAILURE MODE: LEAK-02 SIDE, EXTERNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV769592-24

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

DURING PRE- AND POST-EVA, O2 SIDE IS NOT PRESSURIZED EXCEPT DURING PORTIONS OF DONNING AND DOFFING SEQUENCES. DURING EVA, AND THOSE PRE- AND POST-EVA TIMEFRAMES WHEN O2 PRESSURIZATION EXISTS, LEAKAGE WOULD RESULT IN MISSION IMPACT DUE TO LOSS OF PRIMARY O2 REQUIRING USE OF SOP IF EVA. IF SOP WERE FAILED THE CREWPERSON COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 108 FLIGHT: 2/1R

ITEM: RESERVE H2O TANK (ITEM 148)
FAILURE MODE: LEAK-H2O SIDE, EXTERNAL (AND/OR VIA TPC OR TPL)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV769592-24

CAUSES: CORROSION, SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O RESULTS IN FLOW FROM ALL TANKS UNTIL COOLING IS
DEGRADED/LOST REQUIRING MISSION TERMINATION. IF EVA, MISSION
TERMINATION MAY REQUIRE SOP USAGE TO RETURN TO VEHICLE.
LOSS OF CREWPERSON COULD RESULT WITH SOP FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 109 FLIGHT: 3/2R

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: BIASED HIGH (OR FAILED HIGH)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767793-5/SV767793-7

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING

EFFECTS/RATIONALE:

PRE- OR POST-EVA WILL NOT BE ABLE TO ENSURE APPROPRIATE H2O FILL AVAILABLE AND WILL IMPACT C&W-MISSION IMPACT; ALSO, THE AIRLOCK HAS AN H2O GAGE TO COMPARE TO. IF EVA, CREWMEMBER WILL NOT BE FOREWARNED OF "PREMATURE" H2O DEPLETION, BUT CAN USE SUBLIMATER PRESSURE (ITEM 138) TO INDICATE SOP REQUIRED. ADDITIONALLY THE H2O SUPPLY IS ADEQUATE FOR A NORMAL MISSION LENGTH WHICH IS TIMED AND PROVIDED TO THE CREWPERSON. FAILURE OF THESE REDUNDANCIES WOULD RESULT IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 110 FLIGHT: 3/2R

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: BIASED LOW (OR FAILED LOW)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767793-5/SV767793-7

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING, LOSS OF
REFERENCE PRESSURE INTEGRITY-BELLOWS LKG, LOSS OF POWER (SEE
BATTERY FAILURE)-OPEN

EFFECTS/RATIONALE:

PRE- AND POST-EVA WILL NOT BE ABLE TO ENSURE APPROPRIATE H2O FILL
AVAILABLE AND WILL IMPACT C&W-MISSION IMPACT. (THE AIRLOCK HAS
AN H2O GAGE TO COMPARE TO). IF EVA, CREWMEMBER WILL NOT BE FULLY
AWARE OF H2O USAGE. POSSIBLE SOP USAGE REQUIRED IF H2O
USE RATE GREATER THAN NORMAL AND/OR LEAK EXISTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 111 FLIGHT: 2/1R

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: EXTERNAL H2O LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767793-5/SV767793-7

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

GRADUAL H2O LOSS UNTIL IMPACT TO CREWMEMBER COOLING. POSSIBLE
SOP USAGE, IF EVA. LOSS OF CREWPERSON POSSIBLE IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 112 FLIGHT: 2/1R

ITEM: FDW SUPPLY PRESSURE SENSOR (ITEM 132B)
FAILURE MODE: INTERNAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV767793-5/SV767793-7

CAUSES: VIBRATION, FAILURE OF INSULATION, CONTAMINATION

EFFECTS/RATIONALE:

PROBABLE ERRONEOUS READING OF PRESSURE. CURRENT LIMITED IN THE DCM. DECREASES BATTERY RESERVE AVAILABLE. IF EVA, CREWMEMBER MAY GET ERRONEOUS C&W MESSAGES OR BE DEPRIVED OF ACCURATE C&W. EARLY POWER LOSS OR ERRONEOUS C&W CAN RESULT IN SOP BEING USED IF MISSION NOT TERMINATED. CREWPERSON LOSS CAN RESULT IF SOP IS ALSO FAILS WHEN USED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 113 FLIGHT: 3/1R

ITEM: WATER RELIEF VALVE (ITEM 142)
FAILURE MODE: INTERNAL LKG/FAIL OPEN (PRIMARY TANKS TO RESERVE
AND VICE VERSA)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769405-3

CAUSES: SEAL FAILURE, MECHANICAL FAILURE UNABLE TO RESEAT-SPRING
FRACTURE, CRACK PRESSURE LOW

EFFECTS/RATIONALE:

THIS WILL CAUSE ALL TANKS TO DEplete AS ONE. CREWMEMBER WILL BE
UNAWARE OF RESERVE TANK USAGE. HOWEVER, THIS WILL NOT IMPACT THE
USE RATE OF FEEDWATER; RATHER, IT MAY ALLOW FOR CREWMEMBER,
DURING HIGH HEAT-LOAD MISSIONS, TO OVEREXTEND BEYOND AVAILABLE
FEEDWATER SUPPLY AND COOLING WITHOUT WARNING; THEREBY REQUIRING
SOP USAGE IN AN UNPLANNED MANNER. ADDITIONALLY, A MISSION CLOCK
IS AVAILABLE FOR THE EVA CREWMEMBER. FAILURE OF REDUNDANT SOP
ELEMENT CAN RESULT IN LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 114 FLIGHT: 2/1R

ITEM: WATER RELIEF VALVE (ITEM 142)
FAILURE MODE: FAILURE TO OPEN/FAIL CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769405-3

CAUSES: MECHANICAL FAILURE-UNABLE TO OPEN DUE BEING TO STUCK IN
SEAT OR SPRING FAILURE

EFFECTS/RATIONALE:

TOTAL FEEDWATER QUANTITY NOW REDUCED BY .9 LBS. THIS CAN RESULT
IN EARLY MISSION TERMINATION AND LOSS OF FULL COOLING CAPABILITY
VIA SUBLIMATOR. SOP USAGE MAY BE REQUIRED. UNABLE TO DRAIN
RESERVE TANK. POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 115 FLIGHT: 2/1R

ITEM: WATER RELIEF VALVE (ITEM 142)
FAILURE MODE: EXTERNAL LKG

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV769405-3

CAUSES: SEAL FAILURES

EFFECTS/RATIONALE:

LOSS OF FEEDWATER WILL DEGRADE CAPABILITY TO COOL CREWMEMBER AND
MAY RESULT IN USE OF SOP IN ADDITION TO MISSION TERMINATION.
POSSIBLE LOSS OF CREWPERSON WITH SOP FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 116 FLIGHT: 3/1R

ITEM: WATER CHECK VALVE (ITEM 143)
FAILURE MODE: INTERNAL LKG (FROM RESERVE TO PRI)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769406-2

CAUSES: INTERNAL SEAT/SEAL FAILURE-WEAR OR CONTAMINATION, SPRING FAILURE/FRACTURE

EFFECTS/RATIONALE:

THIS WILL CAUSE ALL TANKS TO DEplete AS ONE. THE CREWMEMBER WILL BE UNAWARE OF RESERVE TANK USAGE UNTIL ALL FDW DEPLETED. THIS WILL NOT IMPACT FEEDWATER USE RATE. A MISSION CLOCK IS AVAILABLE TO CREWMEMBER TO INDICATE TYPICAL MISSION DURATION. FOR HIGH HEAT LOAD OR NONTYPICAL MISSIONS, THE CREWMEMBER CAN POSSIBLY BE SUBJECTED TO LOSS OF COOLING THEREBY REQUIRING POSSIBLE SOP USEAGE. POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 117 FLIGHT: 2/1R

ITEM: WATER CHECK VALVE (ITEM 143)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769406-2

CAUSES: MECHANICAL FAILURE MAINTAINS SEAL, SPRING
FAILURE/FRACTURE

EFFECTS/RATIONALE:

UNABLE TO CHARGE/RECHARGE RESERVE H2O TANK THEREBY IMPACTING
MISSION. (DETECTION OF PROBLEM BY H2O QUANTITY USED FOR FILL.)
IF UNDETECTED BY WATER MANAGEMENT, EVA CREWMEMBER MAY BE
SUBJECTED TO PREMATURE LOSS OF COOLING AND REQUIRE THE SOP TO
RETURN TO THE VEHICLE. LOSS OF CREWPERSON WITH SOP FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 118 FLIGHT: 2/1R

ITEM: WATER CHECK VALVE (ITEM 143)
FAILURE MODE: EXTERNAL LEAKAGE (RESERVE TANK SIDE OR PRIMARY
TANK SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV769406-2

CAUSES: SEAL FAILURE AND CONNECTOR

EFFECTS/RATIONALE:

LOSS OF FEEDWATER RESULTS IN MISSION TERMINATION AND POSSIBLE USE
OF SOP FOR COOLING IF EVA. POSSIBLE CREWPERSON LOSS WITH SOP
FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 119 FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE REGULATOR (ITEM 136)
FAILURE MODE: REGULATES HIGH (BIASED OR FULL OPEN)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792528-3

CAUSES: MECHANICAL FAILURE-RESISTANT SPRING FAILURES,
PISTON/PLUNGER STICKS OPEN, CONTAMINATION ON SEAL

EFFECTS/RATIONALE:

PROBABLE SUBLIMATOR FEEDWATER BREAKTHROUGH AND LOSS OF COOLING
WHEN EVA. DETECTABLE VIA PRESSURE SENSOR ITEM 138. SOP WILL
PROVIDE REDUNDANT COOLING.

POSSIBLE LOSS OF CREWPERSON IF SOP FAILS DURING EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 120 FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE REGULATOR (ITEM 136)
FAILURE MODE: REGULATES LOW (BIASED OR FULL CLOSED)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792528-3

CAUSES: PRESSURE REF. FAILURE, CONTAMINATION IS BLOCKING
INTERNAL FLOW PATH, FILTER BLOCKED

EFFECTS/RATIONALE:

LOW PRESSURE REGULATION RESULTS IN DEGRADED COOLING, MISSION
TERMINATION, AND POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF
CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 121 FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE REGULATOR (ITEM 136)
FAILURE MODE: INTERNAL LKG.

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	2/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792528-3

CAUSES: SEAT FAILURE/SEAL FAILURE

EFFECTS/RATIONALE:

ASSUMING EVA WITH THE ISOLATION VALVE OPEN, PROBABLE SUBLIMATOR FEEDWATER BREAKTHROUGH AND SUBSEQUENT LOSS OF COOLING. SOP USAGE POSSIBLE. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED. IF IN AIRLOCK PRE- OR POST-EVA, MISSION IS TERMINATED IF SUBLIMATOR SHUTOFF VALVE FAILS OPEN.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 122 FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE REGULATOR (ITEM 136)
FAILURE MODE: EXTERNAL LKG.

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792528-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FEEDWATER SUPPLY WITH DEGRADATION/LOSS OF COOLING VIA
SUBLIMATOR. SOP USAGE POSSIBLE IF EVA. POSSIBLE LOSS OF
CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 123 FLIGHT: 2/1R

ITEM: FEEDWATER RELIEF VALVE (ITEM 135)
FAILURE MODE: INTERNAL LKG. - FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV769404-6

CAUSES: INTERNAL PLUNGER/DIAPHRAM FAILS MECHANICALLY OPEN,
CONTAMINATION BLOCKS SEAT OPEN

EFFECTS/RATIONALE:
LOSS OF H2O FDW SUPPLY FOR SUBLIMATOR. DEGRADATION-COOLING LOSS
TO CREWMEMBER. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF
CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 124 FLIGHT: 2/1R

ITEM: FEEDWATER RELIEF VALVE (ITEM 135)
FAILURE MODE: EXTERNAL LKG - FDW. SIDE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV769404-6

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF H2O FDW SUPPLY FOR SUBLIMATOR. DEGRATION COOLING LOSS TO CREWMEMBER. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 125 FLIGHT: 2/2

ITEM: FEEDWATER RELIEF VALVE (ITEM 135)
FAILURE MODE: FAILS TO OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV769404-6

CAUSES: PLUNGER MECHANICAL FAILURE; BLOCKED DUE TO
CONTAMINATION, DIAPHRAM FAILURE

EFFECTS/RATIONALE:

FOR A FAILURE TO OPEN SCENARIO, ONE MUST ASSUME OVER-PRESSURIZATION IN THE FWD TANKS EXISTS DUE TO THERMAL EXPANSION. THIS CAN NOT OCCUR DURING EVA DUE TO EVA USAGE OF H2O VIA SUBLIMATOR. PRE- AND POST-EVA, THIS FAILURE CAN RESULT IN DAMAGE TO SEALS, BLADDERS, AND OTHER SYSTEM COMPONENTS; THEREBY REQUIRING MISSION TERMINATION IF DETECTED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 126 FLIGHT: 2/2

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767660-5

CAUSES: INTERNAL SEAL FAILURES, VALVE POPPET UNABLE TO FULLY
SEAT DUE TO CONTAMINATION AND/OR SEAT WEAR

EFFECTS/RATIONALE:

PRESSURE READOUT AT ITEM 138 WILL DETECT INTERNAL LEAKAGE WHEN
VALVE IS CLOSED. LEAKAGE PRE- OR POST-EVA WILL DEplete THE
RESERVOIR OF H2O VIA THE SUBLIMATOR. MISSION TERMINATION
REQUIRED DUE TO FLOODED SUBLIMATOR.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 127 FLIGHT: 2/1R

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: EXTERNAL LEAKAGE (EITHER SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767660-5

CAUSES: SEAL FAILURE - INLET, OUTLET, OR HOUSING

EFFECTS/RATIONALE:

LEAKAGE DURING EVA WILL DEplete H2O RESERVOIRS AND CAUSE LOSS OF COOLING VIA SUBLIMATOR. MISSION TERMINATION REQUIRED WITH POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 128 FLIGHT: 2/1R

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767660-5

CAUSES: SOLENOID MOTOR FAILURE (ELECTRONICS); OPEN/SHORT;
MECHANICAL FAILURE OF MOTOR/VALVE PREVENTS OPENING OR CAUSES
VALVE TO BE STUCK IN CLOSED POSITION, SWITCH FAILURE (SEE DCM),
POWER FAILURE (SEE ELECTRICAL), VIBRATION/CONTAMINATION, BLOCKED
FILTER

EFFECTS/RATIONALE:
ISOLATES H2O FROM SUBLIMATOR RESULTING IN MISSION TERMINATION AND
POSSIBLE USAGE OF SOP, IF EVA. THIS SHOULD BE RAPIDLY DETECTABLE
BY CREWPERSON. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 129 FLIGHT: 2/2

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767660-5

CAUSES: SOLENOID MOTOR FAILURE (ELECTRONICS OPEN OR SHORT),
MECHANICAL FAILURE OF MOTOR OR VALVE PREVENTS CLOSING, SWITCH
FAILURE (SEE DCM), POWER FAILURE (SEE ELECTRICAL)

EFFECTS/RATIONALE:

VALVE IS NORMALLY OPEN DURING EVA. PRE- AND POST-EVA FAILURE
WILL RESULT IN H2O DUMPING TO AIRLOCK VIA SUBLIMATOR AND MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 130 FLIGHT: 2/1R

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: ELECTRONICS SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767660-5

CAUSES: VIBRATION/CONTAMINATION IN SOLENOID ELECTRONICS

EFFECTS/RATIONALE:

DCM CIRCUITRY PROVIDES CURRENT LIMITING. VALVE MAY POSSIBLY REMAIN IN POSITION AT TIME OF FAILURE. USE OF AVAILABLE POWER FROM BATTERY AT HIGHER RATE CAUSES MISSION TERMINATION AND, IF EMU POWER LOST, POSSIBLE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 131 FLIGHT: 2/1R

ITEM: FEEDWATER SHUTOFF VALVE (ITEM 137)
FAILURE MODE: EXCESSIVE/CONTINUOUS CURRENT DRAW - (WILL NOT SHUT OFF)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767660-5

CAUSES: ELECTRONICS FAILURE OR SHORT, DCM SWITCH FAILURE

EFFECTS/RATIONALE:

DCM CIRCUITRY PROVIDES CURRENT LIMITING. BATTERY POWER USED AT HIGHER RATE CAN RESULT IN MISSION TERMINATION AND, IF EMU POWER LOST, POSSIBLE SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 132 FLIGHT: 3/3

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)
FAILURE MODE: BIASED HIGH OR FAILED HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767793-8

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING

EFFECTS/RATIONALE:

IF PRE- OR POST-EVA WOULD BE DETECTABLE BY COMPARISON TO AIRLOCK SENSOR. HOWEVER, IF EVA, IT WILL REQUIRE CREWMEMBER MONITORING OF COOLING CAPABILITY TO VERIFY IF SENSOR FAILURE OR REGULATOR FAILURE.

NO IMPACT TO MISSION, EMU, OR CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 133 FLIGHT: 3/3

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)
FAILURE MODE: BIASED LOW OR FAILED LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767793-8

CAUSES: INTERNAL LINKAGE/WIPER FAILURE-BINDING, LOSS OF PRESS
REF. INTEGRITY-BELLOWS LKG., LOSS OF POWER-OPEN

EFFECTS/RATIONALE:

IF PRE- OR POST-EVA WOULD BE DETECTABLE BY COMPARISON TO AIRLOCK
SENSOR. IF EVA, CREWMEMBER MUST MONITOR COOLING TEMPERATURE TO
VERIFY SENSOR FAILURE VERSUS REGULATOR FAILURE.
NO IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 134 FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767793-8

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FDW H2O SUPPLY CAUSING DEGRADATION/LOSS OF COOLING.
MISSION TERMINATION AND, IF EVA, POSSIBLE SOP USAGE REQUIRED.
POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 135 FLIGHT: 2/1R

ITEM: FEEDWATER PRESSURE SENSOR (ITEM 138)
FAILURE MODE: INTERNAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767793-8

CAUSES: VIBRATION, FAILURE OF INSULATION, CONTAMINATION

EFFECTS/RATIONALE:
INSTRUMENT FAILURE; EXCESSIVE USE OF BATTERY POWER RESULTING IN
EARLY MISSION TERMINATION. IF ALL EMU POWER LOST, MAY REQUIRE
SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 136 FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: EXTERNAL H2O FDW LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/NA
EVA:	2/1R
POST-EVA:	/NA

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV783850-14

CAUSES: SEAL FAILURE, VIBRATION

EFFECTS/RATIONALE:

LOSS OF H2O QUANTITY RESULTS IN EARLY MISSION TERMINATION DUE TO COOLING DEGRADATION/LOSS. POSSIBLE USE OF SOP MAY OCCUR. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 137 FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: SUBLIMATOR BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/
EVA:	2/1R
POST-EVA:	/NA

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV783850-14

CAUSES: CORROSION/DEPOSITION (HISTORY OF DEPOSITION CAUSING BLOCKAGE)

EFFECTS/RATIONALE:

REDUCED COOLING CAPABILITY RESULTS IN EARLY MISSION TERMINATION AND POSSIBLE SOP USAGE.

POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 138 FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: EXTERNAL LCG H2O LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV783850-14

CAUSES: SUBLIMATOR INLET/OUTLET SEAL(S) FAILURE

EFFECTS/RATIONALE:
LOSS OF LCG H2O DRAINS THE FDW TANKS THEREBY REDUCING MISSION
COOLING CAPABILITY. SOP WILL BE REQUIRED IF ALL H2O USED.
POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 139 FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: INTERNAL LCG-TO-FDW LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV783850-14

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

HIGH PRESSURE IN FDW GAP WILL LIKELY CAUSE BREAKTHROUGH AND FAIL EMU COOLING CAPABILITY THEREBY CAUSING CREW PERSON DISCOMFORT, AND REQUIRING SOP USAGE. TERMINATION OF MISSION IF EVA. IF SOP IS FAILED, POSSIBLE LOSS OF CREW PERSON. IF THIS OCCURS IN AIRLOCK PRE-EVA, THE AFFECTED EMU CANNOT PERFORM AN EVA MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 140 FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: INTERNAL LCG-VENT LOOP LEAKAGE (H2O AND O2)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: SV783850-14

CAUSES: VIBRATION CAUSES JOINT FAILURE

EFFECTS/RATIONALE:

DURING EVA, WATER IN VENT LOOP CAN BE CARRIED OVER INTO HELMET AND SSA, WITH THE RESULTANT LOSS OF COOLING AND POSSIBLY THE VENT LOOP. THE PURGE VALVE MUST BE OPENED TO ACTIVATE THE SOP. IF THIS OCCURS, WATER CAN ENTER THE VALVE, FREEZE, AND PREVENT SOP USAGE. (ASSUMES SLURPER CANNOT HANDLE THE AMOUNT OF H2O LEAKAGE.) CREWPERSON CAN BE LOST IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 141 FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: EXTERNAL VENT LOOP LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV783850-14

CAUSES: SEAL FAILURE AT INLET OR OUTLET, SLURPER OUTER SEAL
FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN ATMOSPHERE WILL RESULT IN EARLY END OF
MISSION AND POSSIBLE USAGE OF SOP TO PROVIDE THE EMERGENCY RETURN
TO ORBITER.
POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 142 FLIGHT: 2/1R

ITEM: SUBLIMATOR (ITEM 140)
FAILURE MODE: SLURPER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/NA
EVA:	2/1R
POST-EVA:	/NA

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:
PART NUMBER: SV783850-14

CAUSES: CONTAMINATION, CORROSION

EFFECTS/RATIONALE:

BLOCKAGE RESULTS IN DEGRADATION OF HUMIDITY REMOVAL CAPABILITY THEREBY INCREASING THE AMOUNT OF H2O IN VENT LOOP OVER THE MISSION. AS THIS CONTINUES, WATER WILL BE CARRIED OVER INTO THE HELMET, SSA, AND WILL DEGRADE THE VENT LOOPS. MISSION TERMINATION WILL RESULT. THE SOP CAN BE USED IF VENT LOOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 143 FLIGHT: 2/1R

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: EXTERNAL LEAKAGE OF H2O

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792503-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O IMPACTS MISSION COOLING CAPABILITY REQUIRING MISSION
TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 144 FLIGHT: 3/3

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: FAILS/BIASED HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV792503-1

CAUSES: ELECTRONICS FAILURE-SHORT DUE TO CONTAMINATION/VIBRATION

EFFECTS/RATIONALE:

ERRONEOUS C&W INDICATION. CREW PERSON CAN MANUALLY CONTROL SUIT
USING SENSORY PERCEPTION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 145 FLIGHT: 2/1R

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792503-1

CAUSES: VIBRATION/CONTAMINATION IN CONNECTOR

EFFECTS/RATIONALE:

EXCESSIVE USAGE OF BATTERY POWER DURING EVA (CURRENT LIMITED)
WILL RESULT IN MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
SENSOR WILL LIKELY BE LOST.
IF POWER AND SOP FAILED, POSSIBLE CREWPERSON LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 146 FLIGHT: 3/3

ITEM: TEMPERATURE SENSOR & HARNESS (ITEM 139)
FAILURE MODE: BIASED LOW OR FAILS LOW (FULL SCALE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792503-1

CAUSES: OPEN IN ELECTRONICS DUE TO VIBRATION

EFFECTS/RATIONALE:
ERRONEOUS C&W INDICATION. CREW PERSON MUST EMPLOY SENSORY
PERCEPTION. NO IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 147 FLIGHT: 2/2

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: INTERNAL LEAKAGE VIA NORMAL FLOW PATHS (GAS TRAP
INLET TO VALVE OUTLET TO WATER SEPARATOR)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769480-3

CAUSES: SEAL FAILURE INTERNAL, PLUNGER STICKS, SPRING BREAKS

EFFECTS/RATIONALE:

INTERNAL LEAKAGE WITH H2O SEPARATOR OFF CAN RESULT IN VENT LOOP
FLOODING AT THE FAN WHEN WATER LOOPS ARE PRESSURIZED. SINCE H2O
SEP IS NORMALLY-ON DURING EVA, THE PRIMARY IMPACTS WOULD BE PRE-
AND POST-EVA AND NO IMPACT IF DURING EVA.
EMU UNAVAILABLE TO PERFORM MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 148 FLIGHT: 2/1R

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: INTERNAL LEAKAGE FROM GAS TRAP INLET TO SENSE PORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV769480-3

CAUSES: HOUSING SEAL FAILURE, DIAPHRAM FAILURE

EFFECTS/RATIONALE:

LOSS OF DIFFERENTIAL PRESSURE ACROSS DIAPHRAM CAUSING PITOT TO CLOSE. THIS IN TURN CAUSES GAS-WATER TO BYPASS THE FAN-SEPARATOR WHICH WILL THEREBY CREATE A POSSIBLE OCCURRENCE OF A BUBBLE ENTERING THE H2O PUMP AND FAILING H2O FLOW. IF THIS OCCURS THE SOP WILL BE REQUIRED TO BE USED. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 149 FLIGHT: 2/1R

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: EXTERNAL LEAKAGE (INLET FROM GAS TRAP, OUTLET TO
H2O SEPARATOR, AND VIA SHAFT SEAL)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV769480-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

H2O LEAKAGE WOULD CAUSE DEPLETION OF H2O TANKS OVER TIME, THEREBY REMOVING COOLING CAPABILITY AND POSSIBLY EXPOSING IN-SUIT LCG LINES TO VACUUM. CREWMEMBER SHOULD RETURN TO VEHICLE UPON INDICATION OF RESERVE H2O TANK USAGE AND CAN USE THE SOP IF NECESSARY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 150 FLIGHT: 2/1R

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: INLET FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769480-3

CAUSES: CONTAMINATION/DEPOSITION (E.G. ALUMINUM-OXIDE),
CORROSION

EFFECTS/RATIONALE:

UNABLE TO MAINTAIN FLOW FROM GAS TRAP. THIS WILL INCREASE GAS
CONCENTRATION IN FLUID LOOPS UNTIL SUFFICIENT AMOUNT IS
ACCUMULATED TO IMPACT COOLANT FLOW AND THEREFORE COOLING
CAPABILITY.

IF EVA, CREWMEMBER COULD USE THE SOP AS A REDUNDANT COOLING PATH
VIA PURGE VALVE DURING RETURN TO VEHICLE. POSSIBLE LOSS OF
CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 151 FLIGHT: 2/1R

ITEM: PITOT ACTUATED VALVE (ITEM 125)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV769480-3

CAUSES: SPRING BREAKS, SHAFT STICKS, DIAPHRAM FAILURE CAUSES
LOSS OF REFERENCE PRESSURE

EFFECTS/RATIONALE:

UNABLE TO MAINTAIN FLOW FROM GAS TRAP. THIS WILL INCREASE GAS
CONCENTRATION IN FLUID LOOPS UNTIL SUFFICIENT AMOUNT IS
ACCUMULATED TO IMPACT COOLANT FLOW AND THEREFORE COOLING
CAPABILITY.

IF EVA, CREWMEMBER COULD USE THE SOP AS A REDUNDANT COOLING PATH
VIA PURGE VALVE DURING RETURN TO VEHICLE. POSSIBLE LOSS OF
CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 152 FLIGHT: 2/1R

ITEM: CHECK VALVE AND HOUSING (ITEM 128)
FAILURE MODE: EXTERNAL LEAKAGE OF H2O

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767699-1

CAUSES: HOUSING SEAL FAILURE, INLET/OUTLET SEAL FAILURE, TEST
PORT-H CAP SEAL FAILURE.

EFFECTS/RATIONALE:

LOSS OF H2O AND DECREASED COOLING CAPABILITY. MISSION IMPACTED
DUE TO LOSS OF COOLING H2O. POSSIBLE/PROBABLE USE OF SOP TO
RETURN TO AIRLOCK.

POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 153 FLIGHT: 2/2

ITEM: CHECK VALVE AND HOUSING (ITEM 128)
FAILURE MODE: INTERNAL H2O LEAKAGE/FAILED OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV767699-1

CAUSES: HOUSING SEAL FAILURE, FLAPPER STUCK DUE TO CONTAMINATION
OR CORROSION

EFFECTS/RATIONALE:

CHECK VALVE IS NORMALLY OPEN WHEN ON EVA; THEREFORE NO EVA
IMPACT. FAILURE PRE- OR POST-EVA CAN RESULT IN LOSS OF IMMEDIATE
OR NEXT MISSION DUE TO INABILITY TO CHARGE (PRIME) H2O PUMP WITH
H2O RESULTING IN LOSS OR SEVERE DEGRADATION OF H2O FLOW.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 154 FLIGHT: 2/1R

ITEM: CHECK VALVE AND HOUSING (ITEM 128)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767699-1

CAUSES: FLAPPER STUCK CLOSED DUE TO CONTAMINATION OR CORROSION

EFFECTS/RATIONALE:

LOSS OF ALL COOLING FLOW REQUIRING IMMEDIATE TERMINATION OF EVA MISSION. LOSS OF CREWMEMBER COOLING DURING EVA REQUIRES USE OF SOP TO RETURN TO VEHICLE.

POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 155 FLIGHT: 2/1R

ITEM: PUMP INLET FILTER (ITEM 127)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778543-3

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF H2O WILL CONTINUE UNTIL DEPLETED. TERMINATION OF
MISSION. POSSIBLE USE OF SOP BY CREWMEMBER TO RETURN TO VEHICLE.
POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 156 FLIGHT: 2/1R

ITEM: PUMP INLET FILTER (ITEM 127)
FAILURE MODE: BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778543-3

CAUSES: CORROSION, CONTAMINATION

EFFECTS/RATIONALE:

CONDENSATE NOT RECIRCULATED, GOES INTO H2O TANKS AND SUBLIMATOR VIA 171 AND 172 VALVES. UNABLE TO CHARGE THE LCVG PRE- AND POST-EVA. LOSS OF MAKEUP FDW DURING EVA CAN CAUSE REDUCTION OF COOLING TO CREWMEMBER THEREBY IMPACTING MISSION. IF COOLING IS SIGNIFICANTLY DEGRADED SOP USAGE MAY BE REQUIRED. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 157 FLIGHT: 2/1R

ITEM: PUMP INLET FILTER (ITEM 127)
FAILURE MODE: PASSAGE OF CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778543-3

CAUSES: FILTER ELEMENT RUPTURE, ELEMENT SEAL TO HOUSING FAILURE

EFFECTS/RATIONALE:

PUMP EXPOSED TO CONTAMINANTS. PROBABLE REDUCTION OR LOSS OF COOLING PUMP FLOW RESULTING IN CORRESPONDING DEGRADATION/LOSS OF COOLING. LOSS OF COOLING FLOW DURING EVA RESULTS IN MISSION TERMINATION AND POSSIBLE USE OF SOP FOR COOLING. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 158 FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV78493-3

CAUSES: HOUSING SEAL FAILURE, H2O INLET/OUTLET SEAL FAILURE,
H2O/GAS OUTLET SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF H2O WILL DRAIN SUPPLY RESULTING IN NO COOLING FOR
CREWMEMBER DURING EVA. SOP WILL BE REQUIRED FOR EVA CASE; SCU
FOR PRE- AND POST-EVA CASES.

POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 159 FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: GAS BREAKTHROUGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV78493-3

CAUSES: HYDROPHYLIC SCREEN DETACHES FROM HOUSING, HOUSING SEAL FAILS, GAS ORIFICE BLOCKED DUE TO CONTAMINATION

EFFECTS/RATIONALE:
FAILURE CAN RESULT IN INABILITY TO PUMP H2O DUE TO GAS IN WATER PUMP. THIS CAN CAUSE MISSION FAILURE DUE TO LOSS OF COOLING CAPABILITY, AND, IF EVA, MAY REQUIRE SOP USAGE TO RETURN TO ORBITER.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 160 FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: SCREEN BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV78493-3

CAUSES: GROSS CONTAMINATION ON SCREEN, GROSS CORROSION

EFFECTS/RATIONALE:
SEVERELY RESTRICTS H2O FLOW AND THEREFORE DEGRADES COOLING TO THE CREWMEMBER. IF EVA, MISSION WILL TERMINATE AND POSSIBLE SOP USAGE MAY RESULT.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 161 FLIGHT: 2/1R

ITEM: GAS TRAP (ITEM 141)
FAILURE MODE: INTERNAL LEAKAGE (H2O INLET TO GAS OUTLET)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: SV78493-3

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

EXCESSIVE FLOW TO FAN SEPARATOR CAN RESULT IN H2O CARRY-OVER TO VENT LOOP. H2O CAN THEN MIGRATE TO HELMET AND SSA WHERE PURGE VALVES ARE. IF VALVES ARE USED AND H2O FREEZES IN VALVES, SOP AND COOLING O2 SUPPLY CAPABILITY WOULD BE LOST. POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 162 FLIGHT: 2/1R

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: EXTERNAL LEAKAGE OF H2O

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV769403-6

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE (INTERNAL LEAKAGE TO AMBIENT)

EFFECTS/RATIONALE:
LOSS OF COOLING FDW REQUIRES CREWMEMBER TO TERMINATE MISSION.
POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 163 FLIGHT: 3/2R

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV769403-6

CAUSES: SPRING FRACTURE, DIAPHRAM FAILURE, PLUNGER STICKS DUE TO CORROSION/CONTAMINATION, INTERNAL LEAKAGE DUE TO HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

PRIMARY IMPACT IS DURING PRE-EVA AND POST-EVA SCENARIOS WHEN FAN SEPARATOR IS OFF. VENT LOOP FLOODING, WHEN CHARGING OR RECHARGING H2O LOOPS WITH A FAILED OPEN FDW ISOLATION VALVE (171) OR CLOSE VALVE (177) WILL RESULT IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 164 FLIGHT: 2/1R

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: BLOCKED INLET FILTER (FAILS CLOSED)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:
PART NUMBER: SV769403-6

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:

NO FLOW PATH FOR CONDENSATE RESULTS IN VENT LOOP FLOODING AND
LOSS OF FAN/SEPARATOR/H2O PUMP. CAN IMPACT USE OF SOP DUE TO
POSSIBLE FREEZING AND BLOCKAGE OF PURGE VALVE (NECESSARY FOR USE
OF SOP) BY FREE WATER.
POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 165 FLIGHT: 2/1R

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:

PART NUMBER: SV769403-6

CAUSES: SPRING FRACTURE, PLUNGER STICKS (DUE TO
CORROSION/CONTAMINATION)

EFFECTS/RATIONALE:

NO FLOW PATH FOR CONDENSATE RESULTS IN VENT LOOP FLOODING AND
LOSS OF FAN/SEPARATOR/H2O PUMP. CAN IMPACT USE OF SOP DUE TO
POSSIBLE FREEZING OF WATER IN THE PURGE VALVES.
POSSIBLE LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 166 FLIGHT: 3/3

ITEM: CONDENSATE H2O RELIEF VALVE (ITEM 134)
FAILURE MODE: FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV769403-6

CAUSES: FILTER ELEMENT FILTER, HOUSING-TO-FILTER SEAL FAILURE

EFFECTS/RATIONALE:

POSSIBLE IMPACT TO VALVE OPERATION. DOWNSTREAM ELEMENTS ARE PROTECTED BY FILTERS. NO IMMEDIATE IMPACT TO ANY INTERFACES OR ITEMS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 167 FLIGHT: 2/1R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SEAL FAILURE AT ANY INLET OR OUTLET, HOUSING SEAL(S)
FAILURE

EFFECTS/RATIONALE:

LOSS OF COOLING FDW REQUIRES CREWMEMBER TO TERMINATE MISSION AND,
IF EVA, POSSIBLY USE SOP FOR COOLING.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 168 FLIGHT: 3/2R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: INTERNAL LEAKAGE - FAILS OPEN (FDW TANKS TO LCG
LOOPS)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: HOUSING SEAL FAILURE, LINKAGE FAILURE

EFFECTS/RATIONALE:

PRE- AND POST-EVA FAILED OPEN (WHICH IS NORMAL EVA MODE) CAN
RESULT IN VENT LOOP FLOODING WHEN FAN SEPARATOR IS OFF AND EITHER
THE 125 OR 134 VALVE FAILS OPEN; THIS IN TURN CAUSES MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 169 FLIGHT: 2/1R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: FAILS CLOSED (NO FDW FLOW PATH TO LCG COOLING
LOOPS)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: POPPET STUCK, OPEN ELECTRICAL CONNECTION, SHORT FROM
OPEN TO CLOSED

EFFECTS/RATIONALE:

PRE- AND POST-EVA WOULD BE UNABLE TO CHARGE/RECHARGE EMU. DURING
EVA, FOR SCENARIO WHERE LARGE AMOUNT OF HUMIDITY EXISTS AND THE
REDUNDANT INTERFACE TO THE FDW TANKS (VIA THE 172 VALVE) IS LOST,
IT MAY BE POSSIBLE TO CAUSE CONDENSATE BACK FLOW INTO THE
FAN AND VENT LOOP AND LOSS OF FAN UNIT. IF SOP WERE USED, IT TOO
COULD FAIL DUE TO THE PURGE VALVE BEING BLOCKED BY FROZEN WATER.
LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 170 FLIGHT: 2/1R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: CONTINUOUS MOTOR DRAW OF CURRENT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SHORT

EFFECTS/RATIONALE:

AVAILABLE BATTERY POWER WILL BE DRAINED CAUSING MISSION
TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 171 FLIGHT: 3/1R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: FILTER ELEMENT BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: GROSS CONTAMINATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF CHARGE/RECHARGE CAPABILITY PRE- AND POST-EVA RESULTS IN MISSION IMPACT. IF EVA, H2O MAKEUP CAPABILITY WILL BE IMPACTED AS LCVG COMPLETES DEGASSING. IF THE 172 VALVE WERE FAILED CLOSED IN A HIGH HUMIDITY SCENARIO WITH THE LCVG "HARD CHARGED"; IT WOULD BE POSSIBLE TO FLOOD THE VENT LOOP AND CAUSE THE SOP TO BE REQUIRED. CREWPERSON COULD BE LOST IF SOP FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 172 FLIGHT: 2/1R

ITEM: H2O SHUTOFF VALVE (ITEM 171)
FAILURE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: CONTAMINATION IN ELECTRONICS

EFFECTS/RATIONALE:

SHORT IS CURRENT LIMITED IN DCM. VALVE COULD FAIL CLOSED AND BATTERY RESERVE COULD BE IMPACTED. IF LOW POWER DURING EVA, MISSION TERMINATION RESULTS WITH POSSIBLE SOP USAGE. POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 173 FLIGHT: 2/1R

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF H2O REQUIRES MISSION TERMINATION AND POSSIBLE SOP USAGE.
POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 174 FLIGHT: 2/2

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SPRING FRACTURE, DIAPHRAM FAILURE, PLUNGER STICKS,
INTERNAL LEAKAGE DUE TO HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

DURING CHARGE OR RECHARGE, H2O IS SHORT CIRCUITED AND AN
INEFFECTIVE CHARGE RESULTS. ALSO, IF 134 VALVE FAILS OPEN DURING
PRE- OR POST-EVA, THE VENT LOOP COULD BE FLOODED RESULTING IN
MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 175 FLIGHT: 2/1R

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: BLOCKED INLET FILTER

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/1R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

ASSUMING A HARD CHARGE OF H2O THROUGHOUT EMU SYSTEM AND A 171 VALVE FAILED CLOSED, CONDENSATE WOULD NOT FLOW OUT OF SYSTEM INTO TANKS, THEREBY CAUSING FLOODING OF VENT LOOP AND MISSION TERMINATION. IF THE LOOP IS FLOODED FREE WATER COULD MIGRATE TO THE SSA WHERE IT COULD BLOCK THE PURGE VALVES BY FREEZING WHEN THEY ARE OPENED TO ACTIVATE THE SOP. THIS WILL RESULT IN POSSIBLE CREWPERSON LOSS IF SOP UNABLE TO OPERATE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 176 FLIGHT: 2/1R

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/1R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: SPRING FRACTURE, PLUNGER STICKS

EFFECTS/RATIONALE:

ASSUMING A HARD CHARGE OF H2O THROUGHOUT EMU SYSTEM AND A 171 VALVE FAILED CLOSED, CONDENSATE WOULD NOT FLOW OUT OF SYSTEM INTO TANKS, THEREBY CAUSING FLOODING OF VENT LOOP AND MISSION TERMINATION. IF THE LOOP IS FLOODED FREE WATER COULD MIGRATE TO THE SSA WHERE IT COULD BLOCK THE PURGE VALVES BY FREEZING WHEN THEY ARE OPENED TO ACTIVATE THE SOP. THIS WILL RESULT IN POSSIBLE CREWPERSON LOSS IF SOP UNABLE TO OPERATE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/26/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 177 FLIGHT: 3/3

ITEM: COOLANT RELIEF VALVE (ITEM 172)
FAILURE MODE: FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV784982-1 (MOTOR VALVE SV784998)

CAUSES: FILTER ELEMENT FAILURE, HOUSING-TO-FILTER SEAL FAILURE

EFFECTS/RATIONALE:

POSSIBLE IMPACT TO VALVE OPERATION. DOWNSTREAM ELEMENTS ARE PROTECTED BY FILTERS. NO DEFINEABLE IMMEDIATE IMPACT TO ANY INTERFACES OR ITEMS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 178 FLIGHT: 2/1R

ITEM: ROTARY H2O SEPARATOR (ITEM 123 B)
FAILURE MODE: PITOT TUBE (H2O OUTLET) BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:
PART NUMBER: SV787994-8

CAUSES: CONTAMINATION (E.G. KOROPON)

EFFECTS/RATIONALE:

BLOCKAGE RESULTS IN H2O CARRYOVER INTO VENT LOOP PERMITTING WATER TO MIGRATE TO HELMET AND SSA. PURGE VALVES NECESSARY FOR SOP USAGE COULD POSSIBLY BE BLOCKED BY ICE. SOP USAGE REQUIRED DUE TO VENT LOOP FAILURE.

POSSIBLE LOSS OF CREWPERSON IF SOP FUNCTION FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 179 FLIGHT: 2/1R

ITEM: ROTARY H2O SEPARATOR (ITEM 123 B)
FAILURE MODE: EXTERNAL LEAKAGE (H2O OUTLET OR H2O/GAS INLET)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787994-8

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

DEGRADATION OF COOLING FUNCTION RESULTING IN MISSION TERMINATION
AND POSSIBLE SOP USAGE IF EVA.

POSSIBLE LOSS OF CREWPERSON IF SOP FUNCTION FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 180 FLIGHT: 2/1R

ITEM: ROTARY H2O SEPARATOR (ITEM 123 B)
FAILURE MODE: BEARINGS BIND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV787994-8

CAUSES: CONTAMINATION IN BEARINGS

EFFECTS/RATIONALE:

REDUCED RPM, POSSIBLE H2O CARRYOVER INTO VENT LOOP, REDUCED VENT LOOP FLOW DUE TO COMMON SHAFT. H2O CARRYOVER CAN RESULT IN WATER MIGRATING INTO HELMET AND SSA WHERE, IF PURGE VALVE WERE USED, THE WATER COULD FREEZE IN THE VALVE AND BLOCK IT. THE PURGE VALVE IS REQUIRED FOR SOP USAGE WHICH MAY BE REQUIRED DUE TO THIS FAILURE. POSSIBLE LOSS OF CREWPERSON IF EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 181 FLIGHT: 2/1R

ITEM: WATER PUMP (ITEM 123C)
FAILURE MODE: EXTERNAL LEAKAGE (H2O INLET OR OUTLET)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV772277

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
DEPLETION OF H2O RESERVES, LOSS OF COOLING, MISSION TERMINATION,
POSSIBLE SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 182 FLIGHT: 2/1R

ITEM: WATER PUMP (ITEM 123C)
FAILURE MODE: REDUCED FLOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV772277

CAUSES: BEARINGS BIND DUE TO CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
LOADS MOTOR, EXCESSIVE POWER DRAW, REDUCED VENT FLOW; MISSION
TERMINATION AND, IF EVA, POSSIBLE SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 183 FLIGHT: 2/1R

ITEM: WATER PUMP (ITEM 123C)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV772277

CAUSES: SEAL FAILURE, CRACK/SPLIT IN CLOSURE PLUG

EFFECTS/RATIONALE:

WATER CAN MIGRATE INTO AND FAIL MOTOR. LOSS OF COOLING AND VENTILATION. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 184

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: FAN (ITEM 123A)
FAILURE MODE: EXTERNAL LEAKAGE-02

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787994-8

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY 02. MISSION TERMINATION. POSSIBLE SOP USAGE.
LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 185

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: FAN (ITEM 123A)
FAILURE MODE: LOW FLOW

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787994-8

CAUSES: BEARINGS BIND, BLADES OFF-BALANCE DUE TO CONTAMINANT
BUILD-UP

EFFECTS/RATIONALE:

REDUCED SPEED/FLOW. LOADS MOTOR EXCESSIVELY. MISSION
TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 186 FLIGHT: 2/1R

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: BEARINGS BIND OR SEIZE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787993-7

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:

OVERLOAD MOTOR, EXCESSIVE CURRENT DRAW WHICH CAN RESULT IN LOSS OF COOLING AND VENT LOOPS. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 187 FLIGHT: 2/1R

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: FAILS OFF

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV787993-7

CAUSES: OPEN IN ELECTRICAL POWER LEADS OR CONNECTOR

EFFECTS/RATIONALE:
LOSS OF COOLING AND VENT LOOPS. MISSION TERMINATION. POSSIBLE
SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 188 FLIGHT: 2/1R

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: LOW SPEED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787993-7

CAUSES: WINDING OPEN OR SHORTED, SPEED CONTROL ELECTRONICS
FAILURE

EFFECTS/RATIONALE:

LOW COOLING AND VENT FLOW. MISSION TERMINATION. POSSIBLE SOP
USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 189 FLIGHT: 2/1R

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: HIGH SPEED (EXCESSIVE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787993-7

CAUSES: SPEED CONTROL ELECTRONICS FAILURE, SHORT TO WINDINGS
PROVIDES CONTINUOUS CURRENT

EFFECTS/RATIONALE:

INCREASED POWER CONSUMPTION DRAINS BATTERY. MISSION TERMINATION.
POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 190 FLIGHT: 2/1R

ITEM: BRUSHLESS MOTOR (ITEM 123B)
FAILURE MODE: SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787993-7

CAUSES: CONTAMINATION ACROSS LEADS, CONNECTORS, WINDINGS,
INSULATION FAILS DUE TO CHAFFING

EFFECTS/RATIONALE:

IF STILL OPERATING, INCREASED POWER CONSUMPTION DRAWS BATTERY
DOWN AND REDUCES COOLING AND VENT FLOW. IF SHORT CAUSES MOTOR TO
NOT OPERATE, COOLING AND VENT LOOPS ARE LOST. MISSION
TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 191 FLIGHT: 2/1R

ITEM: MUFFLER (ITEM 170)
FAILURE MODE: EXTERNAL LEAKAGE (INLET OR OUTLET)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785890

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY O2 AND MISSION TERMINATION. IF EVA, SOP
USAGE MAY BE REQUIRED.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 192

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792600-00

CAUSES: SEAL FAILURE AT INLET OR OUTLET

EFFECTS/RATIONALE:

EXTERNAL LEAKAGE RESULTS IN DEPLETION OF PRIMARY O2, DEGRADATION OF CO2 REMOVAL CAPABILITY. MISSION TERMINATION, AND POSSIBLE USE OF SOP TO RETURN TO VEHICLE.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 193 FLIGHT: 2/1R

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: PARTICULATE FILTER PARTIALLY BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792600-00

CAUSES: EXCESSIVE CONTAMINANTS IN SYSTEM AT START-UP

EFFECTS/RATIONALE:
REDUCED VENT FLOW. H2O RETENTION IN LiOH BED CAUSING GRADUAL
LOSS OF CO2 REMOVAL CAPABILITY. MISSION TERMINATION. POSSIBLE
SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 194 FLIGHT: 2/1R

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: TEFLON SCREEN PARTIALLY BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792600-00

CAUSES: EXCESSIVE CONTAMINANTS IN SYSTEM AT STARTUP

EFFECTS/RATIONALE:

REDUCED VENT FLOW. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.

POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 195 FLIGHT: 2/1R

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [3] B [P] C [P]

LOCATION:
PART NUMBER: SV792600-00

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

UNDETERMINABLE BYPASS OF LIOH. REDUCED/DEGRADED CO2 REMOVAL.
CO2 BUILDUP. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 196 FLIGHT: 2/1R

ITEM: CONTAMINANT CONTROL CARTRIDGE (ITEM 480)
FAILURE MODE: L1OH RELEASED TO VENT LOOP

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV792600-00

CAUSES: RUPTURE OF PARTICULATOR FILTER, FILTER SEAL SEPARATION
FROM HOUSING

EFFECTS/RATIONALE:

POSSIBLE CONTAMINANT CONTRIBUTING TO FAN FAILURE, REDUCED COOLING
EFFICIENCY, BLOCKAGE OF SLURPER, AND/OR MIGRATION TO AND FAILURE
OF FAN SEPARATOR DUE TO CONTAMINANT BLOCKAGE OF PITOT TUBE.
ALSO, L1OH IS AN IRRITANT TO CREW PERSON IF IT GETS IN EYES
ORAL/NASAL PASSAGES. MISSION TERMINATION. POSSIBLE SOP USAGE IF
EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 197 FLIGHT: 2/1R

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771836-28

CAUSES: SEAL FAILURE, DPN SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY O2 AND PRESSURE INTEGRITY. MISSION TERMINATION.
POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 198 FLIGHT: 2/1R

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771836-28

CAUSES: CORROSION/CONTAMINATION JAMS VALVE CLOSED, CORROSION ON
BEARINGS/LINKAGE, SPRING FRACTURE

EFFECTS/RATIONALE:
LOSS OF VENT LOOP. MISSION TERMINATION AND, IF EVA, POSSIBLE SOP
USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 199

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: SENSOR FAILS LOW

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV771836-28

CAUSES: OPEN IN ELECTRICAL CONNECTOR OR SWITCH, CORROSION ON
SWITCH CONTACTS

EFFECTS/RATIONALE:

FAIL LOW WOULD IMPACT MISSION BY INDICATING INAEQUATE FLOW DURING
CHECKOUT AND MISSION; THEREBY REQUIRING MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 200 FLIGHT: 2/2

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: VALVE FAILS OPEN-INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/2R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:

PART NUMBER: SV771836-28

CAUSES: DISC WARPED/BENT, SPRING FRACTURE JAMS VALVE OPEN,
CORROSION ON BEARINGS, OR LINKAGE

EFFECTS/RATIONALE:

NO IMPACT UNLESS A SECOND FAILURE (E.G. LOSS OF VENT LOOP) OCCURS
REQUIRING SOP USAGE WHILE EVA. THE SOP FLOW WOULD THEN BE SPLIT
AND NOT FULLY AVAILABLE TO THE ORAL-NASAL AREA OF THE CREWMEMBER,
THEREBY INCREASING CO2 AND HUMIDITY LEVELS TO THE
CREWMEMBER. MISSION TERMINATION WOULD THEN BE REQUIRED.
ADDITIONALLY, THE PRE-EVA SOP CHECK COULD NOT BE PERFORMED
WITHOUT SIGNIFICANT SOP O2 LOSS. MISSION TERMINATION WOULD
RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 201 FLIGHT: 2/2

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)
FAILURE MODE: SENSOR FAILS HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/2R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV771836-28

CAUSES: SHORT IN ELECTRICAL SWITCH, BELLOWS FAILS LEAKING

EFFECTS/RATIONALE:

FAILING HIGH WOULD RESULT IN LOSS OF "VENT LOOP FLOW LOW" CAUTION AND WARNING TO THE CREWMEMBER. FOR PRE- AND POST-EVA OPERATIONS, THIS WOULD RESULT IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86

HIGHEST CRITICALITY HDW/FUNC

SUBSYSTEM: EMU

MDAC ID: 202

FLIGHT: 2/1R

ITEM: CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)

FAILURE MODE: SHORT

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV771836-28

CAUSES: CONTAMINATION ACROSS ELECTRICAL CONTACTS, WIRE CHAFFING.

EFFECTS/RATIONALE:

INCREASES USAGE OF AVAILABLE BATTERY POWER REDUCING MISSION LENGTH. POSSIBLE SOP USAGE MAY BE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 203 FLIGHT: 2/1R

ITEM: C02 TRANSDUCER (ITEM 122)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767798-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY O2 REQUIRING MISSION TERMINATION. MAY ALSO
REQUIRE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 204 FLIGHT: 2/2

ITEM: C02 TRANSDUCER (ITEM 122)
FAILURE MODE: SENSOR FAILS HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [NA]

LOCATION:

PART NUMBER: SV767798-1

CAUSES: OPEN IN REFERENCE ELECTRICAL LEAD, ELECTRONICS FAILURE
IN COMPARISON CIRCUITRY

EFFECTS/RATIONALE:

PREMATURE MISSION TERMINATION DUE TO FALSE HIGH READING.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 205 FLIGHT: 3/1R

ITEM: CO2 TRANSDUCER (ITEM 122)
FAILURE MODE: SENSOR FAILS LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767798-1

CAUSES: LOSS OF REFERENCE, FILM DEPOSITION ON GLASS ELECTRODE,
MEMBRANE BLOCKAGE, OPEN IN ELECTRONICS

EFFECTS/RATIONALE:

MULTIPLE FAILURES ARE REQUIRED FOR SIGNIFICANT IMPACT. HOWEVER,
IF EVA AND THE LiOH CARTRIDGE WERE TO ALSO FAIL, HIGH UNDETECTED
CO2 LEVELS WOULD RESULT REQUIRING MISSION TERMINATION AND
POSSIBLE SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 206 FLIGHT: 2/1R

ITEM: CO2 TRANSDUCER (ITEM 122)
FAILURE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767798-1

CAUSES: CONTAMINATION ACROSS LEADS, VIBRATION CAUSES CONTACT OF
POWER LEADS

EFFECTS/RATIONALE:
PROBABLE LOSS OF SENSOR OUTPUT, EXCESSIVE POWER CONSUMPTION.
MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 207 FLIGHT: 2/1R

ITEM: FILTER AND ORIFICE (ITEM 126)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV772158-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF PRIMARY O2 CAUSING MISSION TERMINATION. POSSIBLE
SOP USAGE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 208 FLIGHT: 3/1R

ITEM: FILTER AND ORIFICE (ITEM 126)
FAILURE MODE: ORIFICE BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV772158-3

CAUSES: CONTAMINATION, FILTER ELEMENT RUPTURE

EFFECTS/RATIONALE:

LOSS OF CO2 MONITORING CAPABILITY. WITH A FAILURE OF CCC CO2 REMOVAL, THE CREWMEMBER MUST RELY ON SENSORY DETECTION. IF EVA, WITH REDUNDANT CCC FAILURE POSSIBLE USE OF SOP. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 209 FLIGHT: 3/2R

ITEM: PRESSURE SUIT SENSOR (ITEM 114)
FAILURE MODE: BIASED HIGH (OR FAILED HIGH)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767788-2

CAUSES: INTERNAL LINKAGE FAILURE, WIPER FAILURE/BINDING

EFFECTS/RATIONALE:
C&W WARNING OF HIGH PRESSURE. CREWMEMBER WILL USE GAGE ON DCM
FOR VERIFICATION. MISSION IMPACT IF GAGE FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 210 FLIGHT: 3/2R

ITEM: PRESSURE SUIT SENSOR (ITEM 114)
FAILURE MODE: BIASED LOW (OR FAILED LOW)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767788-2

CAUSES: INTERNAL LINKAGE FAILURE, WIPER FAILURE-BINDING, LOSS OF
REFERENCE PRESSURE INTEGRITY-BELLOWS LEAKS, LOSS OF POWER/OPEN IN
ELECTRICAL LINES.

EFFECTS/RATIONALE:
C&W WARNING OF LOW PRESSURE. CREWMEMBER CAN VERIFY BY PRESSURE
GAGE ON DCM. MISSION IMPACT IF GAGE FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 211 FLIGHT: 2/1R

ITEM: PRESSURE SUIT SENSOR (ITEM 114)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767788-2

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY O2 RESULTS IN EARLY MISSION TERMINATION WITH
POSSIBLE USE OF SOP IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 212

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: PRESSURE SUIT SENSOR (ITEM 114)
FAILURE MODE: INTERNAL SHORT

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767788-2

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:

SENSOR FAILURE AND INCREASE IN DEMAND UPON BATTERY. MISSION
TERMINATION. IF EVA, CREWMEMBER MAY REQUIRE SOP IF BATTERY POWER
INSUFFICIENT.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 213 FLIGHT: 2/1R

ITEM: RELIEF VALVE AND ORIFICE (ITEM 145)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785860-3

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF PRIMARY O2 RESULTING IN MISSION TERMINATION. IF
EVA, SOP MAY BE REQUIRED.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 214 FLIGHT: 2/2

ITEM: RELIEF VALVE AND ORIFICE (ITEM 145)
FAILURE MODE: INTERNAL LEAKAGE/FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV785860-3

CAUSES: CONTAMINATION ON SEAT, RELAXATION OF SPRING/SPRING
FRACTURE, POPPET/PLUNGER STUCK DUE TO CONTAMINATION

EFFECTS/RATIONALE:

PROVIDES ADDITIONAL VENT FLOW PATH TO SUIT, THEREBY REDUCING FLOW
TO HELMET AND ORAL-NASAL AREA. DURING SOP CHECKOUT, A FAILED
OPEN VALVE WOULD RESULT IN HIGH SOP USAGE COULD RESULT IN MISSION
TERMINATION DUE TO LOSS OF A LARGE QUANTITY OF SECONDARY
OXYGEN SUPPLY. ON EVA, A SECOND FAILURE REQUIRED SOP USEAGE
COULD RESULT IN INEFFICIENT FLUSHING OF THE ORAL-NASAL AREA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 215 FLIGHT: 2/1R

ITEM: RELIEF VALVE AND ORIFICE (ITEM 145)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/1R
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV785860-3

CAUSES: CONTAMINATION ACTS AS AN ADHESIVE ON BALL, SPRING
FRACTURE, POPPET STICKS IN CLOSED POSITION

EFFECTS/RATIONALE:

FAILED CLOSED IS TYPICALLY OF NO IMPACT EXCEPT FOR CASE OF A
FAILED OPEN SOP SECOND STAGE REGULATOR DURING SOP CHECKOUT WHICH
IF IT OCCURRED WOULD RESULT IN THE SYSTEM BEING EXPOSED TO
APPROXIMATELY 200 PSI OXYGEN AND POSSIBLE FAILURE OF STRUCTURAL
INTEGRITY. IF THIS FAILURE WERE VIOLENT ENOUGH, A FIRE COULD
START AND RESULT IN LOSS OF CREWPERSON AND/OR VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 216 FLIGHT: 2/1R

ITEM: POSITIVE PRESSURE RELIEF VALVE (ITEM 146)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787036-3

CAUSES: SEAL FAILURE, DRAIN PORT P SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY 02. MISSION TERMINATION. IF EVA, SOP USAGE MAY
BE REQUIRED.

POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 217 FLIGHT: 2/1R

ITEM: POSITIVE PRESSURE RELIEF VALVE (ITEM 146)
FAILURE MODE: FAILS OPEN/INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV787036-3

CAUSES: SPRING RELAXES, SPRING FRACTURE, POPPET/PLUNGER STICKS
DUE TO CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF PRIMARY O2 AT HIGH RATE. MISSION TERMINATION. IF EVA
AND FAILURE RESULTS IN MAXIMUM FLOW THROUGH VALVE, THE SOP WOULD
BE REQUIRED TO BE USED.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 218 FLIGHT: 2/1R

ITEM: POSITIVE PRESSURE RELIEF VALVE (ITEM 146)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV787036-3

CAUSES: SPRING FRACTURE, POPPET/PLUNGER STUCK, FILTER BLOCKED BY
CONTAMINATION

EFFECTS/RATIONALE:

FOR PRE-EVA, SUIT WOULD OVERPRESSURE DURING AIRLOCK DEPRESS
RESULTING IN MISSION TERMINATION. DURING EVA, IF THE PRIMARY OR
SECONDARY REGULATOR FAILS OPEN, THE PURGE VALVE MUST BE USED BY
CREWMEMBER TO REDUCE SUIT PRESSURE.
POSSIBLE LOSS OF CREWPERSON IF SUIT PRESSURE CANNOT BE REDUCED
RAPIDLY ENOUGH.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 219 FLIGHT: 2/1R

ITEM: NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785927-2

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE
IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 220 FLIGHT: 2/1R

ITEM: NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)
FAILURE MODE: FAIL OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785927-2

CAUSES: POPPET STUCK OPEN, SPRING FRACTURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE
IF EVA.

POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 221 FLIGHT: 2/1R

ITEM: NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)
FAILURE MODE: FAIL CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	2/1R

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:

PART NUMBER: SV785927-2

CAUSES: POPPET STUCK DUE TO CONTAMINATION, SPRING FRACTURE,
FILTER BLOCKED

EFFECTS/RATIONALE:

FAILED CLOSED WOULD IMPACT REPRESSURIZATION OF THE AIRLOCK
(ESPECIALLY AN EMERGENCY REPRESSURIZATION) IN THAT THE CAPABILITY
TO EQUALIZE PRESSURE BETWEEN THE SUIT AND AIRLOCK IS LOST VIA
ITEM 147.

SUIT DAMAGE COULD OCCUR RESULTING IN LOSS OF FUTURE MISSIONS.
POSSIBLE INJURY CAN ALSO RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 222 FLIGHT: 2/1R

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: EXTERNAL LEAKAGE AT INLET

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE AT 02 FILL PORT INLET INTERFACE

EFFECTS/RATIONALE:

EXTERNAL LEAKAGE AT THIS INTERFACE SHOULD ONLY IMPACT PRE- AND POST-EVA FILL/RECHARGE OPERATIONS UNLESS ACCOMPANIED BY INTERNAL LEAKAGE SUCH THAT THE PRIMARY 02 SUPPLY WOULD BE DEPLETED. AN ACCEPTABLE FILL SHOULD STILL BE OBTAINED UNLESS LEAKAGE IS GROSS. THIS LEAK, IF UNDETECTED, COULD ALSO DEplete VEHICLE 02 SUPPLY. LOSS OF PRIMARY 02 DURING EVA WOULD REQUIRE SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 223 FLIGHT: 2/1R

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: EXTERNAL LEAKAGE AT OUTLET

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE AT INTERFACE TO 02 TANK AND ORIFICE
MANIFOLD

EFFECTS/RATIONALE:

DEPLETION OF PRIMARY 02. MISSION TERMINATION. POSSIBLE SOP
USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 224 FLIGHT: 2/2

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: INLET OR OUTLET FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:

UNABLE TO FILL OR RECHARGE EMU 02 TANKS. (DURING EVA FILTERS ARE NOT USED).

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 225 FLIGHT: 3/1R

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: INLET FILTER FAILS-PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: FILTER ELEMENT RUPTURE, FILTER SEAL TO HOUSING FAILS

EFFECTS/RATIONALE:

CONTAMINATION COULD CAUSE CHECK VALVE FAILURE TO SEAL AND, IF UPSTREAM EXTERNAL LEAK OCCURRED, POSSIBLE MISSION TERMINATION. FAILURE OF THE DOWNSTREAM FILTER COULD RESULT IN BLOCKAGE OF THE 113C SHUTOFF VALVE INLET FILTER OR THE FLOW ORIFICE AND CAUSE A REDUCED FLOW OF PRIMARY O2 TO BE PROVIDED THE CREWPERSON. LOSS OF O2 OR IMPAIRED FLOW COULD RESULT IN SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 226 FLIGHT: 2/1R

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: OUTLET FILTER FAILS-PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: FILTER ELEMENTS RUPTURE, FILTER SEAL TO HOUSING FAILS

EFFECTS/RATIONALE:

WORST CASE IS FOR THE ELEMENT TO RUPTURE (OTHERWISE INLET FILTER PROVIDES REDUNDANCY) PASSING CONTAMINANTS INTO TANKS AND ORIFICE. POSSIBLE BLOCKAGE OR FLOW CONSTRICTION IN ORIFICE. CONTAMINANTS WOULD BE FILTERED AGAIN AT SHUTOFF VALVE (113C) INLET. IF SIGNIFICANT BLOCKAGE OCCURS, INSUFFICIENT O2 FLOW MAY RESULT FOR SUIT PRESSURIZATION DURING PRE-EVA. IF EVA, INSUFFICIENT O2 FLOW COULD RESULT IN SOP USAGE AND POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 227

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: BALL STUCK DUE TO CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO FILL OR RECHARGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 228 FLIGHT: 3/1R

ITEM: CHECK VALVE AND FILTER (ITEM 113A)
FAILURE MODE: VALVE FAILS OPEN-INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION ON SEAT

EFFECTS/RATIONALE:

VALVE FAILED OPEN WOULD REQUIRE A SECOND FAILURE OF EXTERNAL LEAKAGE UPSTREAM FOR LOSS OF PRIMARY O2 WHICH WOULD REQUIRE POSSIBLE SOP USAGE, IF EVA, AND MISSION TERMINATION. POSSIBLE LOSS OF CREWMEMBER IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 229 FLIGHT: 2/1R

ITEM: ADJUSTABLE ORIFICE (ITEM 113B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS. FOR PRE- AND
POST-EVA CHARGE/RECHARGE, IF UNDETECTED, THE LEAKAGE WILL ALSO
CAUSE LOSS OF A "LEAK-RATE DEPENDENT" QUANTITY OF VEHICLE 02.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 230 FLIGHT: 2/1R

ITEM: ADJUSTABLE ORIFICE (ITEM 113B)
FAILURE MODE: NO FLOW-BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION, ADJUSTMENT SCREW ROTATES

EFFECTS/RATIONALE:
LOSS OR DEGRADATION OF O2 FLOW TO VENT LOOP AND H2O TANK
BACKPRESSURE REGULATOR. MISSION TERMINATION. POSSIBLE SOP USAGE
REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 231 FLIGHT: 2/1R

ITEM: ADJUSTABLE ORIFICE (ITEM 113B)
FAILURE MODE: HIGH FLOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/1R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: ADJUSTMENT SCREW ROTATES, EROSION

EFFECTS/RATIONALE:

HIGH FLOW WOULD REQUIRE A PRIMARY REGULATOR OR WATER REGULATOR FAILED OPEN TO OVER PRESSURIZE THE SUIT. THE 146 RELIEF VALVE WILL NOT PROVIDE EMU PRESSURE PROTECTION AT THESE HIGH FLOW RATES. POSSIBLE LOSS OF CREWPERSON CAN THEREFORE RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 232 FLIGHT: 2/1R

ITEM: ON/OFF VALVE (ITEM 113C)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE USE OF
SOP IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 233 FLIGHT: 2/2

ITEM: ON/OFF VALVE (ITEM 113C)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE, BALL/PLUNGER STUCK DUE TO CONTAMINATION

EFFECTS/RATIONALE:

UNABLE TO PERFORM EVA DUE TO NO O2 PATH FROM TANK TO SUIT.
MISSION TERMINATION. FUTURE MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 234 FLIGHT: 2/2

ITEM: ON/OFF VALVE (ITEM 113C)
FAILURE MODE: FAILED OPEN/INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE, BALL/PLUNGER STUCK DUE TO
CONTAMINATION, CONTAMINATION ON SEAT

EFFECTS/RATIONALE:

VALVE IS NORMALLY OPEN DURING EVA. DURING PRE- OR POST-EVA
TIMEFRAMES AND FOR LOW H2O TANKS, NO H2O CHARGE WOULD BE CAPABLE
DUE TO BACKPRESSURE. ALSO, WOULD HAVE A CONSTANT O2 LEAK TO SUIT
AND AIRLOCK. LOSS OF MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 235 FLIGHT: 2/1R

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN WHEN O2 SHUTOFF VALVE IS OPEN. MISSION
TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF
CREWPERSON IS SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 236 FLIGHT: 2/1R

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: INTERNAL LEAKAGE/FAILED OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES:

EFFECTS/RATIONALE:

EXCESSIVE O2 FLOW TO SUIT. POSSIBLE OVERPRESSURIZATION REQUIRING THE 146 RELIEF VALVE TO OPERATE. LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 237 FLIGHT: 2/1R

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: CONTAMINATION FAILS STEM CLOSED, SPRING FRACTURE, INLET
FILTER BLOCKED

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN TO VENT LOOP. MISSION TERMINATION.
POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREW PERSON IF SOP
ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 238 FLIGHT: 2/1R

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: REGULATES LOW/DRIFTS LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: BALANCE STEM STICKS, SPRING RELAXES/FRACTURES, ORIFICE
TO SENSE PORT BLOCKED, CONTAMINATION/DEPOSITS SKEW PARTS
ALIGNMENT

EFFECTS/RATIONALE:

LOW PRESSURE CAN RESULT IN SOP USAGE TO ENSURE CREWMEMBER
ENVIRONMENT MAINTAINED ABOVE 3.3 PSIA. MISSION TERMINATION.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 239

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: REGULATES HIGH/DRIFTS HIGH

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: BALANCE STEM STICKS, SPRING RELAXES/FRACTURES,
CONTAMINATION DEPOSITS SKEW PARTS ALIGNMENT

EFFECTS/RATIONALE:

HIGH PRESSURE CAN RESULT IN OVERPRESSURIZATION OF SUIT THEREBY
CAUSING 146 RELIEF VALVE TO OPEN. FINAL RESULT WILL BE LOSS OF
PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA,
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 240 FLIGHT: 2/2

ITEM: PRIMARY REGULATOR (ITEM 113D)
FAILURE MODE: IV-EV LINKAGE FAILURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [NA] C [NA]

LOCATION:

PART NUMBER: SV778873-12

CAUSES: JAMS DUE TO CONTAMINATION ACTING AS AN ADHESIVE, SPRING FRACTURE, SHEAR PLATE ASSEMBLY FAILURE (SEE SHEAR PLATE ASSEMBLY)

EFFECTS/RATIONALE:

BECAUSE THE FAILURE IS A MECHANICAL FAILURE, IT IS NOT APPLICABLE TO EVA IN THAT NO IV TO EV OR EV TO IV OPERATION OCCURS AT THAT TIME. FAILURE PRE- OR POST-EVA RESULTS IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 241 FLIGHT: 2/1R

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: SEAL FAILURE, BELLOWS FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN AND/OR WATER TANKS BACKPRESSURE AND
THEREFORE COOLING. IF EVA, POSSIBLE SOP USAGE REQUIRED.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 242 FLIGHT: 2/1R

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: FAILS OPEN-INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE, CONTAMINATION CAUSES PLUNGER TO STICK,
BELLOWS FAILURE, SEAT FAILURE DUE TO CONTAMINATION

EFFECTS/RATIONALE:

HIGH OXYGEN FLOW/PRESSURE RESULTS IN HIGHER THAN NOMINAL FLOW TO
SUIT VIA 120B RELIEF VALVE. SUIT OVERPRESSURE PROTECTED BY 146
RELIEF VALVE. LOSS OF O2 RESULTS AND MISSION IS TERMINATED. SOP
USAGE MAY BE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 243 FLIGHT: 2/1R

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: REFERENCE VOLUME CONTAMINATION BLOCKS REFERENCE
RESULTING IN HIGH PRESSURE REF., SPRING RELAXES

EFFECTS/RATIONALE:
DOWNSTREAM 120B RELIEF VALVE WILL OPERATE RESULTING IN EXCESS O2
FLOW TO SUIT. SUIT OVERPRESSURE PROTECTED BY 146 RELIEF VALVE.
LOSS OF O2 RESULTS AND MISSION IS TERMINATED. SOP USAGE MAY BE
REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 244 FLIGHT: 2/1R

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING RELAXES

EFFECTS/RATIONALE:

LOW PRESSURE TO SUIT LCG PUMP LOOP RESULTING IN DEGRADED COOLING.
MISSION TERMINATION AND, IF EVA, POSSIBLE SOP USAGE AND CHANGING.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 245 FLIGHT: 2/1R

ITEM: H2O REGULATOR (ITEM 113E)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778873-12

CAUSES: SPRING FRACTURE/FAILURE, CONTAMINATION/CORROSION CAUSES
PLUNGER TO STICK

EFFECTS/RATIONALE: _____
LOSS OF H2O RESERVOIR PRESSURE. COOLING LOSS. MISSION
TERMINATES. IF EVA, POSSIBLE SOP USAGE REQUIRED. POSSIBLE LOSS
OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 246 FLIGHT: 2/1R

ITEM: PRIMARY OXYGEN BOTTLES (ITEM 111)-QTY-2
FAILURE MODE: EXTERNAL LEAKAGE (NON-VIOLENT)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778895/SV784099-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE
SOP USAGE REQUIRED. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO
FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 247 FLIGHT: 1/1

ITEM: PRIMARY OXYGEN BOTTLES (ITEM 111)-QTY-2
FAILURE MODE: RUPTURE-VIOLENT OXYGEN RELEASE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	1/1
EVA:	1/1
POST-EVA:	1/1

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778895/SV784099-1

CAUSES: WELD/SEAM FAILURE, MATERIAL FATIGUE

EFFECTS/RATIONALE:
VIOLENT RELEASE OF OXYGEN WOULD BE ACCOMPANIED BY SHRAPNEL AND/OR PARTICULATE WHICH COULD IMPINGE UPON NEARBY METAL COMPONENTS AND THE EVA/IVA CREWPERSON. IN ADDITION TO SHRAPNEL INJURY, A REAL FIRE HAZARD WOULD EXIST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 248 FLIGHT: 2/1R

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778528-2

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE
SOP USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 249 FLIGHT: 2/2

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: DRIFTS LOW (NOT FULL SCALE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778528-2

CAUSES: BINDING IN BEARING OR LINKAGE, LOSS OF REFERENCE CAVITY
PRESSURE INTEGRITY

EFFECTS/RATIONALE:
(LOW READING COULD BE VERIFIED IN AIRLOCK VERSUS AIRLOCK 02
PRESSURE GAGE). CAUTION AND WARNING SYSTEM AND CREWPERSON UNABLE
TO OBSERVE TOTAL PRESSURE OF 02 REMAINING. POSSIBLE MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 250 FLIGHT: 2/2

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: FAILS FULL LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778528-2

CAUSES: OPEN IN ELECTRICAL LEAD/CONNECTOR, BINDING IN BEARING OR LINKAGE

EFFECTS/RATIONALE:

CAUTION AND WARNING SYSTEM AND THE CREW PERSON WOULD BE UNABLE TO OBSERVE THE TIME TOTAL PRESSURE OF O2 REMAINING. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 251 FLIGHT: 2/1R

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: DRIFTS HIGH (NOT FULL SCALE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778528-2

CAUSES: BOURDON TUBE RELAXES OVER TIME, LINKAGE FAILURE, SHIFT
IN WIPER TO RESISTIVE ELEMENT

EFFECTS/RATIONALE:
(VALVE CAN BE VERIFIED IN AIRLOCK VERSUS AIRLOCK 02 PRESSURE
GAGE.) CAUTION AND WARNING SYSTEM IS DEFEATED IN PREDICTING
MISSION PARAMETERS AND 02 REMAINING. 02 CAN BE DEPLETED DURING
EVA REQUIRING SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 252 FLIGHT: 2/1R

ITEM: PRIMARY O2 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: FAILS HIGH-FULL SCALE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778528-2

CAUSES: SHORT IN ELECTRONICS, LINKAGE STICKS

EFFECTS/RATIONALE:

CAUTION AND WARNING SYSTEM IS NOT ABLE TO PREDICT MISSION PARAMETERS AND PROVIDE TIME O2 REMAINING QUANTITY. MISSION TERMINATION. IF O2 IS DEPLETED IN AN UNPLANNED MANNER DURING EVA, SOP USAGE MAY BE REQUIRED. POSSIBLE LOSS OF CREWPERSON LOSS IS SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 253 FLIGHT: 1/1

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: BOURDON TUBE RUPTURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	1/1
EVA:	1/1
POST-EVA:	1/1

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV778528-2

CAUSES: MATERIAL DEFECT, FATIGUE

EFFECTS/RATIONALE:

HIGH PRESSURE OXYGEN FLOW INTO CAVITY AND SENSOR ELECTRONICS
COULD RESULT IN A FIRE, LOSS OF EMU AND CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 254 FLIGHT: 2/1R

ITEM: PRIMARY 02 PRESSURE SENSOR (ITEM 112)
FAILURE MODE: ELECTRICAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778528-2

CAUSES: CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:

WILL LIKELY LOSE PRESSURE READING AND CAUSE EXCESS POWER USAGE.
MISSION COULD TERMINATE. POSSIBLE SOP USAGE IF BATTERY FAILURE
OCCURS. POSSIBLE LOSS OF CREW PERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 255 FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: 02 MANIFOLD FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO CHARGE O2 TANKS. UNABLE TO OBTAIN PRIMARY OXYGEN FROM
TANKS DURING EVA; THEREFORE, MISSION TERMINATION AND POSSIBLE SOP
USAGE. POSSIBLE LOSS OF CREWPERSON IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 256 FLIGHT: 3/2R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: 02 MANIFOLD FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: FILTER RUPTURES, FILTER HOUSING SEAL FAILS

EFFECTS/RATIONALE:

CONTAMINANTS WOULD BE RELEASED WHICH COULD FAIL THE DOWNSTREAM SHUT-OFF VALVE OR WATER REGULATOR, IF THE REDUNDANT FILTERS AT EACH WERE ALSO FAILED. MISSION TERMINATION WOULD RESULT IF DETECTED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 257 FLIGHT: 3/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: EXTERNAL LEAKAGE OF OXYGEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: 02 FILL LINE SEAL FAILURE OR FITTING FAILURE (PRIOR TO 113A CHECK VALVE)

EFFECTS/RATIONALE:
EMU LEAK RESULTS IN LOSS OF VEHICLE 02 AND EXTENSION OF EMU 02 CHARGE TIME. MISSION TERMINATION. IF CHECK VALVE (ITEM 113A) ALSO FAILED OPEN, PRIMARY 02 IN TANKS WOULD BE LOST. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 258 FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: EXTERNAL LEAKAGE OF OXYGEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778540-26

CAUSES: SEAL FAILURE (O2 BOTTLE VERIFIED, TRANSFER TUBE FROM
ITEM 113 TO 120, AND/OR 113 OUTLET TRANSFER TUBE)

EFFECTS/RATIONALE:

PRIMARY O2 LOSS. MISSION TERMINATION. POSSIBLE SOP USAGE IF
EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 259 FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILS IN THE "OFF" POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE-JAMS DUE TO SPRING FRACTURE, BEARING
BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS

EFFECTS/RATIONALE:
UNABLE TO OPEN SHUTOFF VALVE. UNABLE TO PERFORM EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 260 FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILS IN THE "IV" POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE-JAMS DUE TO SPRING FRACTURE, BEARING BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS, FAILURE OF LINKAGE AT THE 113 REGULATOR BY BEARINGS JAMMING

EFFECTS/RATIONALE:

UNABLE TO PRESSURIZE EMU FOR EVA. UNABLE TO SHUTOFF O2 SUPPLY FROM EMU; THEREFORE, SINCE EVA CANNOT BE PERFORMED, THE O2 WILL DUMP INTO THE AIRLOCK CREATING AN OXYGEN-RICH ATMOSPHERE UNLESS VENTILATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 261 FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILS IN THE "PRESS" POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE-JAMS DUE TO SPRING FRACTURE, BEARING BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS, FAILURE OF LINKAGE AT 113 REGULATOR BY BEARINGS JAMMING

EFFECTS/RATIONALE:

UNABLE TO OPEN SOP SHUTOFF VALVE AND UNABLE TO CLOSE PRIMARY O2 SHUTOFF VALVE. MISSION TERMINATION. O2 WILL BE DUMPED INTO THE AIRLOCK CREATING AN OXYGEN-RICH ATMOSPHERE UNLESS VENTILATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 262 FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILS IN THE "EVA" POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV778540-26

CAUSES: LINKAGE FAILURE-JAMS DUE TO SPRING FRACTURE, BEARING BINDING, ACTUATOR CABLE CONNECTION SHEARS OR DISCONNECTS, FAILURE OF LINKAGE AT THE 113 REGULATOR BY BEARINGS JAMMING

EFFECTS/RATIONALE:

NO IMPACT TO IMMEDIATE EVA; HOWEVER SUBSEQUENT EVA MISSIONS CANNOT BE PERFORMED. REMAINING OXYGEN AND SOP OXYGEN WILL BE DUMPED TO THE AIRLOCK CREATING AN OXYGEN-RICH ENVIRONMENT UNLESS VENTILATED.

IF A SPARK WERE TO OCCUR DUE TO A SECOND FAILURE DURING THE TIME OF OXYGEN ENRICHMENT, A FIRE COULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 263 FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILURE TO OPEN THE PRIMARY 113C SHUTOFF VALVE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	/NA

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: SPRING FRACTURE OR RELAXATION

EFFECTS/RATIONALE:
UNABLE TO PERFORM EVA MISSION OR PRESSURIZE EMU DUE TO NO O2 PATH
FROM TANKS TO SSA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 264 FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: FAILURE TO CLOSE THE PRIMARY 113C SHUTOFF VALVE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/NA
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: SPRING FRACTURE OR RELAXATION

EFFECTS/RATIONALE:

PRIMARY OXYGEN WILL BE DUMPED INTO AIRLOCK CAUSING AN OXYGEN-RICH ENVIRONMENT UNLESS VENTILATED. ALSO UNABLE TO CHARGE OR RECHARGE EMU VIA SCU DUE TO OPEN PATH TO EMU.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 265 FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO OPEN SOP SHUTOFF VALVE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778540-26

CAUSES: LINKAGE/CAM FAILURE LOOSE OR STRIPPED, ACTUATOR CABLE
STRETCHED

EFFECTS/RATIONALE:

SOP UNAVAILABLE FOR EVA; HOWEVER IT WOULD PERFORM THE MANUAL PRE-
EVA CHECKOUT. IF OTHER FAILURE, REQUIRING TO SOP OCCURS DURING
EVA, CREWMEMBER/EMU WOULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 266 FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO CLOSE SOP SHUTOFF VALVE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778540-26

CAUSES: LINKAGE/CAM FAILURE-LOOSE OR STRIPPED, ACTUATOR CABLE STRETCHED

EFFECTS/RATIONALE:

SOP WOULD ACTIVATE DURING POST EVA OPERATIONS. SOP OXYGEN WOULD DUMP INTO AIRLOCK CREATING AN OXYGEN-RICH ENVIRONMENT UNLESS VENTILATED. MISSION TERMINATION RESULTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 267 FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO PLACE PRIMARY REGULATOR IN .5 PSI
POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: CHANGE LINKAGE SPRING FRACTURED OR RELAXED, BEARINGS
BIND

EFFECTS/RATIONALE:
UNABLE TO PERFORM LOW-PRESSURE IV OPERATIONS; EVA MAY STILL BE
PERFORMED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86
SUBSYSTEM: EMU
MDAC ID: 268

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: FAILURE TO PLACE PRIMARY REGULATOR IN 4.3 PSI
POSITION

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV778540-26

CAUSES: CHANGE LINKAGE SPRING FRACTURED OR RELAXED, BEARINGS
BIND

EFFECTS/RATIONALE:

UNABLE TO OBTAIN OR MAINTAIN EVA PRESSURE. POSSIBLE SOP USEAGE
(DUE TO SOP BEING ENABLED) IF IN EVA POSITION AND PRESSURE DROPS
TO SOP RANGE. UNABLE TO PERFORM MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 269 FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: SLIDE ACTUATOR DETENT FAILURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: SPRING FRACTURES OR RELAXES

EFFECTS/RATIONALE:
LOSS OF "OFF, IVA, AND PRESS" POSITIONS DISPLAY CAPABILITY. EVA
CAN PROCEED WITHOUT IMPACT. "EVA" POSITION EMPLOYS AN ADDITIONAL
LOCK MECHANISM AND DISPLAY CAPABILITY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 270 FLIGHT: 2/1R

ITEM: SHEAR PLATE ASSEMBLY (ITEM 115)
FAILURE MODE: EVA POSITION LOCK FAILURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: SV778540-26

CAUSES: SPRING FRACTURES OR RELAXES

EFFECTS/RATIONALE:

EVA POSITION SLIPPAGE MAY OCCUR REQUIRING MANUAL PLACEMENT UPON C&W WARNING. BACKUP NORMAL SLIDE ACTUATOR DETENTE PROVIDES REDUNDANCY.

IF OUT OF EVA POSITION, SOP IS SHUT OFF AND UNAVAILABLE TO SUPPORT CREWPERSON IN THE EVENT OF A PLSS FAILURE REQUIRING BACK-UP. IF THIS OCCURS POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 271 FLIGHT: 2/2

ITEM: EVA POSITION SWITCH (ITEM 116)
FAILURE MODE: FAILS OPEN-NO SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV789111

CAUSES: OPEN IN LEADS OR CONNECTOR, SWITCH FRACTURE

EFFECTS/RATIONALE:

CANNOT VERIFY O2 ACTUATOR AND SOP SHUTOFF VALVE STATUS. MISSION TERMINATION. IF IT OCCURS EVA, IT WILL REQUIRE A JUDGEMENT CALL REGARDING ITS VERACITY. LOSS OF LOW SUIT PRESSURE LIMIT CHECK IN C&W WHICH IS ENABLED BY THIS SIGNAL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 272 FLIGHT: 2/2

ITEM: EVA POSITION SWITCH (ITEM 116)
FAILURE MODE: FAILS CLOSED-CONTINUOUS SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV789111

CAUSES: SHORT ACROSS LOADS OR CONNECTOR, FAILURE OF HERMETIC SEAL, CONTAMINATION

EFFECTS/RATIONALE:
CANNOT VERIFY 02 ACTUATOR AND SOP SHUTOFF VALVE STATUS. MISSION TERMINATION. IF IT OCCURS EVA, IT WILL NOT BE DETECTABLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 273 FLIGHT: 2/1R

ITEM: BLEED ORIFICE (ITEM 120A)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785844-6

CAUSES: HOUSING SEAL FAILURE, SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. COOLING
DEGRADATION. POSSIBLE USE OF SOP IF EVA. POSSIBLE LOSS OF
CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 274 FLIGHT: 2/1R

ITEM: BLEED ORIFICE (ITEM 120A)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV785844-6

CAUSES: HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

EXCESSIVE O2 FLOW TO SUIT. POSSIBLE SUIT OVERPRESSURIZATION
OPENING RELIEF VALVE ITEM 146, RESULTING IN O2 LOSS. MISSION
TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE CREWPERSON
LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 275 FLIGHT: 3/2R

ITEM: BLEED ORIFICE (ITEM 120A)
FAILURE MODE: BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV785844-6

CAUSES: CONTAMINATION OR CORROSION IN ORIFICE, SCREEN/FILTERS
BLOCKED BY CONTAMINATION OR CORROSION, UPSTREAM FILTER FAILS BY
RUPTURING CAUSING ORIFICE OR DOWNSTREAM FILTER TO BLOCK

EFFECTS/RATIONALE:

POSSIBLE 113E H2O REGULATOR CHATTER. RELIEF VALVES 120B PROVIDE
REDUNDANT PATH FOR CHARGING. IF THE 120B VALVES FAIL CLOSED
UNABLE TO CHARGE OR RECHARGE H2O TANKS AND MISSION TERMINATION
RESULTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 276 FLIGHT: 2/1R

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV785844-6

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE ALONG STEM AND SET SCREW

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 277 FLIGHT: 2/1R

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: INTERNAL LEAKAGE/(HI OR LOW FLOW) FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV785844-6

CAUSES: SPRING FRACTURES OR RELAXES, CONTAMINATION ON SEAT,
PLUNGER STICKS DUE TO CONTAMINATION, HOUSING SEAL BYPASSED,
FILTER RUPTURES JAMMING VALVE OPEN.

EFFECTS/RATIONALE:

PROBABLE HIGH FLOW OF O2 TO SUIT AND POSSIBLE OVERPRESSURIZATION.
RELIEF VALVE 146 PREVENTS OVERPRESSURIZATION BUT LOSS OF O2
OCCURS AT THIS TIME. MISSION TERMINATION. POSSIBLE SOP USAGE
REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 278 FLIGHT: 3/2R

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: FAIL CLOSED ("LO" MODE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV785844-6

CAUSES: SPRING FRACTURE, PLUNGER STICKS, CONTAMINATION, FILTER
BLOCKED DUE TO CONTAMINATION

EFFECTS/RATIONALE:

PROBABLE LOSS OF H2O RECHARGE CAPABILITY IF BLEED ORIFICE AND
"HI" MODE VALVE ALSO FAIL CLOSED. MISSION TERMINATION RESULTS
WITH THIS SCENARIO.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 279 FLIGHT: 2/1R

ITEM: DUAL MODE RELIEF VALVE (ITEM 120B)
FAILURE MODE: FAILS CLOSED ("HI" MODE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785844-6

CAUSES: SPRING FRACTURE, PLUNGER STICKS, CONTAMINATION, FILTER
BLOCKED DUE TO CONTAMINATION

EFFECTS/RATIONALE:
CANNOT EFFECTIVELY PROTECT AGAINST A FAILED OPEN 113E REGULATOR.
LOSS OF COOLING COULD RESULT DUE TO H2O TANKS BEING
OVERPRESSURIZED AND FAILING. POSSIBLE SOP USAGE IF EVA.
POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 280 FLIGHT: 2/1R

ITEM: FEEDWATER CHECK VALVE (ITEM 120C)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785844

CAUSES: SEAL FAILURE, TEST PORT "F" SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN RESULTS IN LOSS OF COOLING AND MISSION.
POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 281 FLIGHT: 3/1R

ITEM: FEEDWATER CHECK VALVE (ITEM 120C)
FAILURE MODE: FAILED OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2
EVA:	3/1R
POST-EVA:	3/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV785844

CAUSES: FLAPPER DISC WARPED, CONTAMINATION CAUSES FLAPPER TO STICK

EFFECTS/RATIONALE:
MOISTURE CAPABLE OF MIGRATING TO PRIMARY 113 REGULATORS AND CAUSING CORROSION. THIS CORROSION CAN CAUSE MULTIPLE TYPES OF FAILURE INCLUDING FAILED CLOSED OR OPEN THEREBY REQUIRING MISSION TERMINATION AND, IF EVA, SOP USAGE.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 282 FLIGHT: 2/1R

ITEM: FEEDWATER CHECK VALVE (ITEM 120C)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA;	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV785844

CAUSES: FLAPPER STICKS SHUT DUE TO CONTAMINATION OR WARPING

EFFECTS/RATIONALE:

LOSS OF FEEDWATER PRESSURE CONTROL TO TANKS RESULTING IN OVERALL
LOSS OF COOLING. MISSION TERMINATION. POSSIBLE SOP USAGE IF
EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 283 FLIGHT: 2/1R

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767793-5,-7

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE SOP USAGE
IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 284 FLIGHT: 3/2R

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: FAILED HIGH (OR BIASED HIGH)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767793-5,-7

CAUSES: INTERNAL LINKAGE BINDS, WIPER BINDS

EFFECTS/RATIONALE:

ASSUMING LOSS OF ALL REDUNDANCY, THE MISSION WILL TERMINATE WITH THIS FAILURE TO PROTECT AGAINST POSSIBLE 113E REGULATOR FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 285 FLIGHT: 3/2R

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: FAILED LOW (OR BIASED LOW)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767793-5,-7

CAUSES: INTERNAL LINKAGE/WIPER FIALURE-BINDING, LOSS OF
REFERENCE PRESSURE INTEGRITY-BELLOWS LEAKAGE, LOSS OF POWER/OPEN

EFFECTS/RATIONALE:

ASSUMING LOSS OF ALL REDUNDANCY THE MISSION WILL TERMINATE WITH
THIS FAILURE TO PROTECT AGAINST POSSIBLE LOSS OF FEEDWATER
PRESSURE AND COOLING LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 286 FLIGHT: 2/1R

ITEM: FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)
FAILURE MODE: INTERNAL SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767793-5,-7

CAUSES: VIBRATION, FAILURE OF INSULATION, CONTAMINATION

EFFECTS/RATIONALE:

HIGH USE OF BATTERY POWER IS CURRENT LIMITED BUT CAN RESULT IN LESS OVERALL MISSION POWER. POSSIBLE LOSS OF EMU POWER. MISSION TERMINATION. POSSIBLE SOP USAGE. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 287 FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767789-02

CAUSES: CELL BOND FAILS, RELIEF VALVE SEAL FAILURE

EFFECTS/RATIONALE:

LEAKAGE CAN RESULT IN SUBLIMATION OF ELECTROLYTE, ESCAPE OF HYDROGEN GAS (WHICH PRESENTS A SIGNIFICANT FIRE HAZARD IF IGNITION SOURCE EXISTS). LIKELY BATTERY FAILURE. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 288 FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: RELIEF VALVE FAILS OPEN (INTERNAL LEAKAGE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767789-02

CAUSES: CONTAMINATION ON SEAT, SPRING FRACTURES OR RELAXES

EFFECTS/RATIONALE:

LEAKAGE CAN RESULT IN SUBLIMATION OF ELECTROLYTE, ESCAPE OF HYDROGEN GAS (WHICH PRESENTS A SIGNIFICANT FIRE HAZARD). LIKELY BATTERY FAILURE. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.

POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 289 FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: RELIEF VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/1R
EVA:	2/1R
POST-EVA:	2/1R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767789-02

CAUSES: CONTAMINATION ACTS AS AN ADHESIVE, CORROSION, SPRING FRACTURE

EFFECTS/RATIONALE:
POSSIBLE CELL RUPTURE DUE TO OVERPRESSURIZATION FROM OVERLOAD OR SHORT. POWER LOSS. POSSIBLE RELEASE OF HYDROGEN GAS (FIRE HAZARD). MISSION TERMINATES. POSSIBLE SOP USAGE IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS OR IF CELL RUPTURE IS VIOLENT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 290 FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: GENERATION OF HYDROGEN GAS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/1R
EVA:	2/1R
POST-EVA:	2/1R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767789-02

CAUSES: BATTERY OVERLOADED, SHORT, EXCESSIVE DISCHARGE OF
BATTERY

EFFECTS/RATIONALE:

CELL PRESSURIZATION OCCURS AND RELIEVES VIA RELIEF VALVE.
HYDROGEN GAS WOULD THEN BE DUMPED ABOUT THE PLSS AREA PRESENTING
A POSSIBLE FIRE HAZARD. BATTERY VOLTAGE WOULD BE LOW AND THE
MISSION TERMINATED. IF EVA, POSSIBLE SOP USAGE MAY BE REQUIRED.
POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS OR IF CELL RUPTURES
VIOLENTLY DUE TO RELIEF VALVE ALSO FAILING CLOSED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 291 FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: HIGH RESISTANCE OR OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767789-02

CAUSES: CONTAMINATION ON TERMINALS/CONNECTORS

EFFECTS/RATIONALE:

DROP IN BATTERY VOLTAGE. MISSION TERMINATION DUE TO POWER LOSS
FROM LOW VOLTAGE. POSSIBLE SOP USAGE IF EVA. POSSIBLE
CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/06/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 292 FLIGHT: 2/1R

ITEM: BATTERY (ITEM 490)
FAILURE MODE: SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767789-02

CAUSES: CONTAMINATION/LEAKAGE PATH ACROSS CONNECTORS

EFFECTS/RATIONALE:

BATTERY LOSS. MISSION TERMINATION. POSSIBLE SOP USAGE IF EVA.
GENERATION OF HYDROGEN GAS IN THE BATTERY DUE TO OVERLOAD.
POSSIBLE LOSS OF CREWPERSON IS SOP ALSO FAILS OR IF HYROGEN GAS,
UNABLE TO VENT VIA RELIEF VALVE, CAUSES A VIOLENT RUPTURE OF
THE BATTERY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 295 FLIGHT: 2/1R

ITEM: SECONDARY OXYGEN BOTTLE (ITEM 210)
FAILURE MODE: EXTERNAL LEAKAGE (NON-VIOLENT)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778880-1

CAUSES: SEAL FAILURE AT BOTTLE TO ASSY INTERFACE

EFFECTS/RATIONALE:

LOSS OF SECONDARY OXYGEN SUPPLY. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF EVA WITH FAILURE OF PLSS O2, COOLING, OR POWER. IF PRE- OR POST-EVA, HIGH AIRLOCK O2 CONCENTRATION MAY REQUIRE VENTILATION TO REDUCE FIRE HAZARD.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 296 FLIGHT: 1/1

ITEM: SECONDARY OXYGEN BOTTLE (ITEM 210)
FAILURE MODE: BOTTLE RUPTURE (VIOLENT)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	1/1
EVA:	1/1
POST-EVA:	1/1

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: SV778880-1

CAUSES: SEAM FAILURE-FROM FATIGUE (OR DEFECT) OR THERMAL CYCLING

EFFECTS/RATIONALE:
VIOLENT RUPTURE OF SOP BOTTLE CAN RESULT IN INJURY OR DEATH DUE TO SHRAPNEL AND/OR SIGNIFICANT INCREASE IN PROBABILITY OF FIRE. ADDITIONALLY, SHRAPNEL COULD PUNCTURE AND DEPRESSURIZE THE SUIT IF EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 297 FLIGHT: 2/1R

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778473-4

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF SECONDARY OXYGEN SUPPLY. MISSION TERMINATION. POSSIBLE
LOSS OF CREWMEMBER IF PLSS FAILS O2 DELIVERY. IF SOP IN USE, LEAK
LOWERS EXPECTED DURATION OF USAGE DEPENDENT UPON LEAK SIZE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 298 FLIGHT: 1/1

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	1/1
EVA:	1/1
POST-EVA:	1/1

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778473-4

CAUSES: MATERIAL FATIGUE/FRACTURE BETWEEN PRESSURE SENSE AND
PORT TO 02 LINE

EFFECTS/RATIONALE:

HIGH-PRESSURE OXYGEN ENTERS ELECTRONICS HOUSING WHERE SOURCES OF
IGNITION CAN EXIST. IF INTERNAL LEAK IS VIOLENT, FRICTION OF
PARTICULATE CAN RESULT IN IGNITION SOURCE. IF IGNITION OCCURS,
LOSS OF LIFE, EMU, AND POSSIBLY VEHICLE CAN RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 299 FLIGHT: 2/1R

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: ELECTRONICS SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778473-4

CAUSES: VIBRATION, CONTAMINATION ACROSS LEADS/CONTACTS

EFFECTS/RATIONALE:

HIGHER THAN NOMINAL RATE OF CONSUMPTION OF POWER REDUCES OVERALL MISSION POWER AVAILABLE. POSSIBLE/PROBABLE LOSS OF SENSOR OUTPUT. POSSIBLE LOSS OF POWERED SYSTEMS REQUIRING SOP USAGE. POSSIBLE LOSS OF CREW PERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 300 FLIGHT: 3/2R

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: READS HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778473-4

CAUSES: SHORT OR OPEN IN CIRCUITRY, STRAIN GAGE FAILURE

EFFECTS/RATIONALE:

FAILURE OF SOP PRESSURE READOUT TO DCM. NO IMMEDIATE MISSION IMPACT OR IMPACT TO CREW. PRE-EVA SOP PRESSURE CAN BE VERIFIED BY THE PRESSURE GAGE ON THE 213 REGULATOR. LOSS OF CAPABILITY TO VERIFY SOP 02 PRESSURE DURING EVA.
IF IN USE, NO IMPACT OTHER THAN INABILITY TO DETERMINE AMOUNT OF 02 LEFT IN SOP. LOSS OF GAGE ALSO WOULD RESULT IN MISSION TERMINATION PRE-EVA DUE TO NO SOP MONITORING AVAILABLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 301 FLIGHT: 2/2

ITEM: PRESSURE TRANSDUCER (ITEM 215)
FAILURE MODE: READS LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778473-4

CAUSES: SHORT OR OPEN IN CIRCUITRY, STRAIN GAGE FAILURE

EFFECTS/RATIONALE:
LOW SOP PRESSURE REQUIRES MISSION TERMINATION. IT WOULD BE A JUDGEMENT CALL AS TO THE ACCURACY OF THE TRANSDUCER VERSUS THE GAGE. FAILURE OF GAGE WOULD ONLY RESULT IN SAME EFFECT OF MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 302 FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778473-13

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE, VIA TPD SEAL/CHECK
VALVE FAILURE

EFFECTS/RATIONALE:
LOSS OF SOP OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE LOSS
OF CREWPERSON WITH PLSS FAILURE

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 303 FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: INTERNAL LEAKAGE/FAIL OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778473-13

CAUSES: SPRING FRACTURE, PLUNGER STICKS/JAMS, FAILURE OF BALL TO SEAT

EFFECTS/RATIONALE:

POSSIBLE HIGH O2 FLOW AND HIGH PRESSURE TO SECOND STAGE REGULATOR. POSSIBLE HIGH FLOW AND SUIT OVERPRESSURE CAN RESULT IF A 213D REGULATOR FAILS OPEN WHEN SOP IS ENABLED. USE OF EMU RELIEF VALVES AND/OR PURGE VALVES WOULD THEN BE NECESSARY. MISSION TERMINATION. POSSIBLE CREWPERSON LOSS IF PLSS O2 ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 304 FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778473-13

CAUSES: SPRING FRACTURES/RELAXES, PLUNGER JAMS

EFFECTS/RATIONALE:

HIGH PRESSURE TO 213D REGULATOR CAN RESULT IN HIGH FLOW TO EMU WITH A 213D REGULATOR FAILED OPEN. POSSIBLE SUIT OVER PRESSURIZATION CAN RESULT IF EMU RELIEF VALVES AND/OR PURGE VALVES FAILED.

POSSIBLE CREWPERSON LOSS IF PLSS O2 ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 305 FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778473-13

CAUSES: SPRING FRACTURES, PLUNGER JAMS

EFFECTS/RATIONALE:
ASSUMING SOP IN USE, LOW PRESSURE TO THE 213D REGULATOR CAN
RESULT IN REDUCED FLOW TO CREWPERSON AND EMU. POSSIBLE
CREWPERSON LOSS IF PLSS FAILS ALSO.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 306 FLIGHT: 2/1R

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778473-13

CAUSES: INLET FILTER BLOCKED, SPRING FRACTURES, PLUNGER JAMS

EFFECTS/RATIONALE:

ASSUMING SOP IN USE DUE TO A PLSS FAILURE, NO O2 FLOW TO
CREWPERSON OR EMU CAN RESULT IN BOTH LOSS OF CREWPERSON AND EMU.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 307 FLIGHT: 1/1

ITEM: 1ST STAGE REGULATOR (ITEM 213B)
FAILURE MODE: DIAPHRAM RUPTURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	1/1
EVA:	1/1
POST-EVA:	1/1

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: FATIGUE DUE TO CYCLING

EFFECTS/RATIONALE:

A DIAPHRAM RUPTURE COULD BE VIOLENT OR COULD RESULT IN
PARTICULATES BEING RELEASED TO O2 ENVIRONMENT. FOR EITHER
EFFECT, POSSIBLE FIRE CAN RESULT DUE TO FRICTION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 308 FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF SOP OXYGEN. MISSION TERMINATION. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH FAILURE OF PLSS. IF PLSS SIDE, POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 309 FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: INTERNAL LEAKAGE/FAIL OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778475-13

CAUSES: PLUNGER JAMS, SPRING FRACTURE, BALANCE STEM SEAL FAILURE
(PATH VIA RV), SPRING RELAXES, BALL FAILS TO FULLY SEAT, BELLOWS
(PRESSURE REFERENCE) FAILURE

EFFECTS/RATIONALE:

UNCONTROLLED OXYGEN FLOW TO EMU. POSSIBLE EMU OVERPRESSURIZATION
CONTROLLED BY ITEM 146 RELIEF VALVE. TOTAL FLOW CONTROLLED BY
INTERNAL ORIFICE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK
REQUIRES VENTILATION.

IF EVA, HIGH PRESSURE RESULTS IN PLSS REGULATOR CLOSURE UNTIL ALL
SOP OXYGEN VENTED. MISSION TERMINATION. POSSIBLE LOSS OF
CREWPERSON WITH LOSS OF PLSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 310 FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: SPRING RELAXES, SPRING FRACTURE, BALANCE STEM STICKS,
CONTAMINATION ON PLUNGER/BALL

EFFECTS/RATIONALE:

HIGHER PRESSURE REALIZED IN EMU (PRESSURE LIMITED BY 146 RELIEF
VALVE AND PURGE VALVES). HIGHER O2 FLOW TO EMU WHEN OPERATED.
EFFECTIVELY REDUCES THE PREDICTED 30 MINUTE O2 SUPPLY AVAILABLE
WHEN SOP REQUIRED.
SINCE SOP REGULATION DURING EVA ONLY RESULTS AFTER A PLSS
FAILURE, REDUCED O2 SUPPLY CAN RESULT IN CREWPERSON LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 311 FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: SPRING FRACTURE, PLUNGER STICKS

EFFECTS/RATIONALE:
LOW PRESSURE REGULATION WOULD TERMINATE THE MISSION PRE-EVA AND
RULE OUT FUTURE MISSIONS IF POST-EVA. SINCE SOP REGULATION IS NOT
REQUIRED DURING AN EVA EXCEPT AFTER A PLSS FAILURE, LOW
REGULATOR PRESSURE CAN RESULT IN LOSS OF LIFE DUE TO LOW A
PRESSURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 312 FLIGHT: 2/1R

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: INLET FILTER BLOCKED, MECHANICAL LINKAGE FAILS TO ENABLE
REGULATOR, BALL/PLUNGER JAMS

EFFECTS/RATIONALE:

FAILING CLOSED PRE- OR POST-EVA RESULTS IN TERMINATION OF THE
EXISTING OR FUTURE MISSIONS. FAILURE DURING AN EVA WOULD NOT BE
REALIZED UNTIL REQUIRED SUBSEQUENT TO A FAILURE OF A PRIMARY
REDUNDANT FUNCTION. THE CREWPERSON WOULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 313 FLIGHT: 2/2

ITEM: 2ND STAGE REGULATOR (ITEM 213D)
FAILURE MODE: MECHANICAL LINKAGE FAILS ENGAGED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: FATIGUE, LINKAGE JAMS

EFFECTS/RATIONALE:

THE SOP WOULD REMAIN ENGAGED DURING POST-EVA AND, WHEN AIRLOCK TO SUIT PRESSURE IS LOWER THAN 3.2 PSID, THE SOP WOULD START TO OPERATE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK COULD REQUIRE VENTILATION TO REDUCE FIRE HAZARD. NO FUTURE MISSIONS WOULD BE POSSIBLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 314 FLIGHT: 2/1R

ITEM: SOP PRESSURE GAGE (ITEM 213E)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

GRADUAL LOSS OF SECONDARY OXYGEN SUPPLY. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH LOSS OF PLSS. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK WOULD REQUIRE VENTILATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 315 FLIGHT: 1/1

ITEM: SOP PRESSURE GAGE (ITEM 213E)
FAILURE MODE: BOURDN TUBE RUPTURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	1/1
EVA:	1/1
POST-EVA:	1/1

REDUNDANCY SCREENS: A [2] B [F] C [F]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: MATERIAL FATIGUE/DEFECT

EFFECTS/RATIONALE:
A RUPTURE OF THE BOURDON TUBE COULD BE VIOLENT AND RESULT IN AN
OXYGEN FIRE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 316 FLIGHT: 3/2R

ITEM: SOP PRESSURE GAGE (ITEM 213E)
FAILURE MODE: FAILS HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: LINKAGE FAILURE, BOURDON TUBE RELAXES, CONTAMINATION

EFFECTS/RATIONALE:
IF PRESSURE TRANSDUCER ALSO FAILS, THE CREWPERSON CANNOT VERIFY
SOP PRESSURE PRIOR TO THE MISSION. MISSION TERMINATION SHOULD
RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 317 FLIGHT: 3/2R

ITEM: SOP PRESSURE GAGE (ITEM 213E)
FAILURE MODE: FAILS LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: LINKAGE FAILURE, CONTAMINATION, EXTERNAL LEAKAGE

EFFECTS/RATIONALE:

IF PRESSURE TRANSDUCER ALSO FAILS, THE CREWPERSON CANNOT VERIFY
SOP PRESSURE PRIOR TO THE MISSION. MISSION TERMINATION SHOULD
RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 318 FLIGHT: 2/1R

ITEM: SOP FILL PORT QD AND FILTER (ITEM 213F)
FAILURE MODE: EXTERNAL LEAKAGE/INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: SEAL FAILURE AT ASSEMBLY INTERFACE, SPRING
FRACTURES/RELAXES IN CHECK VALVE, CONTAMINATION ON SEAT, HOUSING
SEAL FAILURE

EFFECTS/RATIONALE:

GRADUAL LOSS OF SECONDARY OXYGEN SUPPLY. IF EVA, POSSIBLE LOSS OF
CREWPERSON WITH LOSS OF PLSS. POSSIBLE HIGH O2 CONCENTRATION IN
AIRLOCK WOULD REQUIRE VENTILATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 319 FLIGHT: 3/3

ITEM: SOP FILL PORT QD AND FILTER (ITEM 213F)
FAILURE MODE: FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [NA] C [NA]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
FILTER IS EMPLOYED DURING FILL OPERATIONS (ONGROUND ONLY),
THEREFORE, NO INPUT FOR FLIGHT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 320 FLIGHT: 3/2R

ITEM: SOP FILL PORT QD AND FILTER (ITEM 213F)
FAILURE MODE: FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778475-13

CAUSES: FILTER TO HOUSING SEAL FAILS, FILTER RUPTURES

EFFECTS/RATIONALE:
GROSS PASSAGE OF CONTAMINANTS CAN RESULT IN BLOCKAGE OF
DOWNSTREAM FILTERS OR CAN CONTRIBUTE TO FAILURE OF THE 1ST STAGE
REGULATOR FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 321 FLIGHT: 3/2R

ITEM: SOP ASSEMBLY (ITEM 200)
FAILURE MODE: BOTTLE INLET FILTER BLOCKED (ONE FILTER FOR EACH BOTTLE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767710-07-08

CAUSES: EXCESSIVE CONTAMINATION IN SYSTEM

EFFECTS/RATIONALE:

DUE TO THE DELTA P WHICH THE FILTER WOULD BE EXPOSED, THE FILTER WOULD LIKELY RUPTURE AND RELEASE CONTAMINANTS DOWNSTREAM TO 1ST STAGE REGULATOR FAILURE WHICH CAN THEN FAIL DUE TO THE CONTAMINATION.

SUCH A FAILURE WOULD THEN RESULT IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/07/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 322 FLIGHT: 2/1R

ITEM: SOP ASSEMBLY (ITEM 200)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SOP
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767710-07-08

CAUSES: DRAIN PORT "M" SEAL FAILURE, PLSS INTERFACE SEAL FAILURE

EFFECTS/RATIONALE:
GRADUAL LOSS OF PLSS OXYGEN. POSSIBLE CREWPERSON LOSS IF SOP
FAILS DURING EVA. POSSIBLE HIGH O2 CONCENTRATION IS AIRLOCK.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 323 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: EXTERNAL LEAKAGE-OXYGEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-12

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE, UNMATED: POPPET
STICKS OPENS, RETURN SPRING FRACTURES/RELAXES

EFFECTS/RATIONALE:

LOSS OF OXYGEN TO EMU MAY RESULT IN OFF-NOMINAL CHARGE AND
MISSION TERMINATION. AIRLOCK O2 CONCENTRATION INCREASES POSSIBLE
FIRE HAZARD IF NOT WELL VENTILATED. POSSIBLE LOSS OF VEHICLE O2.
DURING EVA, O2 VALVE IN AIRLOCK IS CLOSED THEREBY REDUCING LEAK
CAPABILITY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 324 FLIGHT: 2/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: EXTERNAL LEAKAGE-FEEDWATER SUPPLY/DRAIN LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2R
EVA:	2/1R
POST-EVA:	2/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-12

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE; UNMATED: POPPET
STICKS OPENS, RETURN SPRING FRACTURES/RELAXES

EFFECTS/RATIONALE:

LOSS OF FEEDWATER PRESSURE FOR CHARGING EMU MAY RESULT IN OFF-NOMINAL CHARGE AND MISSION TERMINATION. FREE WATER IN AIRLOCK MAY FREEZE IN AIRLOCK VENT VALVE AND BLOCK AIRLOCK DEPRESSURIZATION THEREBY TERMINATING THE MISSION. FEEDWATER SUPPLY VALVE NORMALLY OFF IN AIRLOCK AFTER INITIAL CHARGE. IF EVA PERFORMED W/O DETECTION OF FAILURE TO OBTAIN FULL FEEDWATER CHARGE, COOLING BE LOST PREMATURELY THEREBY REQUIRING SOP USAGE. IF THE SOP ALSO FAILED, CREWPERSON COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 325 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: EXTERNAL LEAKAGE- LCG INLET - LCG OUTLET

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-12

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE; UNMATED: POPPET
STICKS OPENS, RETURN SPRING FRACTURES/RELAXES

EFFECTS/RATIONALE:

POSSIBLE DEGRADED LCG COOLING, INCREASED USAGE OF FEEDWATER
SUPPLY TO CHARGE LCG LINES, THEREBY POSSIBLY DEGRADING FEEDWATER
CHARGE. IN EFFICIENT FEEDWATER CHARGE CAN RESULT IN MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 326 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: CONNECTOR DOES NOT LATCH CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778872-12

CAUSES: LATCH MECHANISM BINDS, COUPLINGS MISALIGN, CAM FAILURE

EFFECTS/RATIONALE:

USE OF SECOND SCU CONNECTOR REQUIRED TO PERFORM MISSION, RECHARGE (O2, H2O, AND POWER) OR INITIAL CHARGE. IF SECOND SCU IS FAILED, MISSION MUST TERMINATE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 327 FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: CONNECTOR DOES NOT RELEASE OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [NA]

LOCATION:

PART NUMBER: SV778872-12

CAUSES: LATCH/LOCK MECHANISM BINDS, CAM FAILURE, COUPLINGS BIND

EFFECTS/RATIONALE:

EMU IS ESSENTIALLY TIED INTO THE AIRLOCK. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 328 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: ELECTRICAL POWER OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-12

CAUSES: PIN PUSHED IN, CONTACT BREAKS, PIN MISALIGNED/BENT,
CORROSION/CONTAMINATION

EFFECTS/RATIONALE:

EMU UNABLE TO BE POWERED VIA SCU WITH FAILURE. BATTERY MUST BE
EMPLOYED AS MUST SECOND SCU. POSSIBLE MISSION IMPACT DUE TO
EARLY BATTERY USAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 329 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: ELECTRICAL POWER SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C []

LOCATION:

PART NUMBER: SV778872-12

CAUSES: PIN(S) MISALIGNED/BENT, CONTAMINATION IN CONNECTOR

EFFECTS/RATIONALE:

HIGH POWER USAGE ON ORBITER SYSTEM. UNABLE TO POWER EMU.
MISSION TERMINATION IF SECOND SCU FAILS. POSSIBLE MISSION
IMPACTS DUE TO EARLY BATTERY USAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 330 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: OPEN IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, PIN FAILURE

EFFECTS/RATIONALE:

UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY
BATTERY USE COULD BE A MISSION DURATION IMPACT. SECOND SCU
AVIALABLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 331 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: SHORT IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR
CONTACTS

EFFECTS/RATIONALE:

UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY
BATTERY USE COULD BE A MISSION IMPACT. SECOND SCU AVAILABLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 332 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: OPEN IN HARDLINE, AUDIO IN OR OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, PIN FAILURE

EFFECTS/RATIONALE:
LOSS OF HARDLINE TWO-WAY COMMUNICATIONS TO VEHICLE. SECOND SCU
AND EVC ARE AVAILABLE FOR COMMUNICATIONS. MISSION TERMINATES IF
ALL REDUNDANCY (IN PARTICULAR TO EVC) ARE FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 333 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 410)
FAILURE MODE: SHORT IN HARDLINE, AUDIO IN OR OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-12

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR
CONTACTS

EFFECTS/RATIONALE:

LOSS OF HARDLINE TWO-WAY COMMUNICATIONS TO VEHICLE. SECOND SCU
AND EVC ARE AVAILABLE FOR COMMUNICATIONS. MISSION TERMINATES IF
ALL REDUNDANCY (IN PARTICULAR THE EVC) ARE FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 334 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR
FAILURE MODE: BATTERY RECHARGE, LINE-OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-12

CAUSES: PIN PUSHED IN, CONTACT BREAKS, PIN MISALIGNED/BENT,
CORROSION/CONTAMINATION

EFFECTS/RATIONALE:
UNABLE TO CHARGE/RECHARGE BATTERY-MISSION TERMINATION IF SECOND
SCU IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 335 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR
FAILURE MODE: BATTERY RECHARGE, LINE-SHORT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-12

CAUSES: PINS MISALIGNED/BENT, CONTAMINATION ACROSS
LEADS/CONTACTS

EFFECTS/RATIONALE:

FAILS TO CHARGE/RECHARGE BATTERY. CAUSES EXCESSIVE BATTERY
DRAIN. MISSION TERMINATION IF SECOND SCU IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 336 FLIGHT: 3/2R

ITEM: HIGH PRESSURE OXYGEN LINE (ITEM 411)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778865-2

CAUSES: FITTING/CONNECTOR, SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF O2 DURING CHARGE-RECHARGE. INEFFICIENT CHARGE MAY REQUIRE USE OF REMAINING SCU TO FINISH O2 CHARGE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK MAY REQUIRE VENTILATION TO MINIMIZE FIRE HAZARD.

MISSION TERMINATION IF SECOND SCU IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 337

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: PORTABLE H2O LINE (ITEM 412A)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV771722-5

CAUSES: FITTING/CONNECTOR SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF FEEDWATER SUPPLY FROM AIRLOCK AND EMU. WATER MAY BE VISIBLE IN AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY. BATTERY IS USED EARLY BECAUSE SCU SUPPLY H2O CANNOT BE ISOLATED FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM. DEGRADED CHARGE/RECHARGE CAPABILITY REQUIRING SECOND SCU TO COMPLETE CHARGE. IF SECOND SCU IS FAILED, MISSION TERMINATION CAN RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 338 FLIGHT: 3/2R

ITEM: COOLING H2O IN-LINE (ITEM 412B)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV771722-6

CAUSES: CONNECTOR/FITTING, SEAL FAILURE

EFFECTS/RATIONALE:

GRADUAL LOSS OF EMU FEEDWATER SUPPLY. WATER MAY BE VISIBLE IN AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY BATTERY USE BECAUSE THE H2O LEAK CANNOT BE ISOLATED FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM. THE LEAK WILL ADDITIONALLY USE AVAILABLE FEEDWATER WHICH CAN RESULT IN AN INSUFFICIENT CHARGE. MISSION TERMINATION CAN RESULT IF SECOND SCU ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 339 FLIGHT: 3/2R

ITEM: COOLING H2O OUT-LINE (ITEM 412C)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV771722-7

CAUSES: CONNECTOR/FITTING SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF EMU FEEDWATER SUPPLY. WATER MAY BE VISIBLE IN AIRLOCK.
MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY POWER.
BATTERY IS USED EARLY BECAUSE THE H2O LEAK CANNOT BE ISOLATED
FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM.
THE LEAK WILL ADDITIONALLY USE AVAILABLE FEEDWATER WHICH CAN
RESULT IN AN INSUFFICIENT CHARGE. MISSION TERMINATION CAN RESULT
IF SECOND SCU ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 340 FLIGHT: 3/2R

ITEM: BACTERIAL FILTER HOUSING (ITEM 416)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: /NA
POST-EVA: 3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767709-14

CAUSES: CONNECTOR SEAL FAILURE, SEAL FAILURE (TO REGULATORS),
HOUSING SEAL FAILURE, TEST PORT "Q" AND/OR "R" SEAL FAILURES

EFFECTS/RATIONALE:

LOSS OF FEEDWATER SUPPLY IN EMU. WATER MAY BE VISIBLE IN
AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY
POWER. BATTERY IS USED EARLY BECAUSE THE H2O LEAK CANNOT BE
ISOLATED FROM THE EMU WITHOUT SCU DISCONNECTION FROM THE DCM.
MISSION TERMINATION IF SECOND SCU IS FAILED AND UNABLE TO
RECHARGE WATER SUPPLY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 341 FLIGHT: 3/2R

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: EXTERNAL LEAKAGE (EMU SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV771717-7

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF FEEDWATER SUPPLY IN EMU. WATER MAY BE VISIBLE IN AIRLOCK. MISSION IMPACT DUE TO PROBABLE EARLY USE OF BATTERY POWER. BATTERY IS USED EARLY BECAUSE FAILED SCU MUST BE DISCONNECTED FROM DCM TO ISOLATE LEAK FROM EMU. ADDITIONALLY, THE LEAK COULD SUFFICIENTLY LOWER THE PRESSURE TO CAUSE THE REGULATOR TO OPEN AND EXPEDITE LOSS OF FEEDWATER SUPPLY. MISSION TERMINATION IF SECOND SCU IS FAILED AND UNABLE TO RECHARGE WATER SUPPLY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 342 FLIGHT: 3/3

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: EXTERNAL LEAKAGE (FILTER SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV771717-7

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

THE LEAK IS ISOLATED BY THE REGULATOR FROM THE EMU RESULTING IN
NO IMPACTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 343 FLIGHT: 3/2R

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: INTERNAL LEAKAGE/FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771717-7

CAUSES: SPRING FRACTURES/RELAXES, CONTAMINATION SEAT, PLUNGER
STICKS, HOUSING SEAL LEAKAGE, MANUAL OVERRIDE STICKS/JAMS OPEN

EFFECTS/RATIONALE: ~~EMU H2O REGULATOR (ITEM 418) WILL BE DISCONNECTED TO ISOLATE~~
LOSS OF SCU FOR H2O CHARGE/RECHARGE. DRAINAGE OF EMU FEEDWATER.
MISSION TERMINATION IF OTHER SCU FAILS. POSSIBLE REDUCTION IN
MISSION LENGTH DUE TO EARLY USE OF BATTERY DUE TO SCU
DISCONNECTION TO ISOLATE DRAINAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 344 FLIGHT: 2/2

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: /NA
POST-EVA: 2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV771717-7

CAUSES: SPRING FRACTURES, STUCK PLUNGER, DIAPHRAGM STICKS,
CONTAMINATION IN AMBIENT SENSE CHAMBER CAUSES SENSE SHIFT

EFFECTS/RATIONALE:

INABILITY TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS
(WHEN EMU IS ALREADY HARD CHARGED) CAN RESULT IN H2O CARRYOVER
INTO THE VENT-LOOP OF PLSS THEREBY CAUSING MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 345 FLIGHT: 3/2R

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: REGULATES LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771717-7

CAUSES: SPRING RELAXES, CONTAMINATION ON SEAT, PLUNGER
COMPRESSES SEAT

EFFECTS/RATIONALE:
(CRACKS AND RESEATS AT A LOWER WATER PRESSURE.) LOSS OF SCU FOR
H2O CHARGE/RECHARGE. DRAINAGE OF EMU FEEDWATER. MISSION
TERMINATION IF OTHER SCU FAILS. POSSIBLE REDUCTION IN MISSION
LENGTH DUE TO EARLY USE OF BATTERY POWER REQUIRED
WHEN SCU IS DISCONNECTED TO ISOLATE FAILURE FROM EMU.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 346 FLIGHT: 2/2

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: REGUALTES HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV771717-7

CAUSES: SPRING FRACTURES, CONTAMINATION IN AMBIENT SENSE CHAMBER

EFFECTS/RATIONALE:
UNABLE TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS CAN
RESULT IN H2O CARRYOVER INTO THE VENT-LOOP OF PLSS THEREBY
CAUSING MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 347 FLIGHT: 3/2R

ITEM: CONDENSATE H2O REGULATOR (ITEM 418)
FAILURE MODE: MANUAL OVERRIDE JAMS (UNABLE TO OPEN VALVE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771717-7

CAUSES: CAM BINDS, PLUNGER JAMS

EFFECTS/RATIONALE:
UNABLE TO DRAIN TANKS. CAN RESULT IN STRETCH AND REDUCED
LIFETIME OF TANK BLADDERS WITH POSSIBLE FAILURE FOR NEXT MISSION
IF NOT DRAINED BY SECOND SCU.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 348 FLIGHT: 3/2R

ITEM: WATER SUPPLY PRESSURE REGULATOR (ITEM 419)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV772190-6

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE, DIAPHRAGM
FAILURE/RUPTURE

EFFECTS/RATIONALE:

LOSS OF FEEDWATER AND/OR FEEDWATER PRESSURE IN H2O TANKS.
MISSION TERMINATION RESULTS IF NO FEEDWATER AVAILABLE FROM SECOND
SCU. PROBABLE MISSION IMPACT DUE TO EARLY BATTERY USAGE TO
CHARGE SCU'S.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 349 FLIGHT: 3/2R

ITEM: WATER SUPPLY PRESSURE REGULATOR (ITEM 419)
FAILURE MODE: INTERNAL LEAKAGE/FAILED OPEN OR REGULATES HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV772190-6

CAUSES: SPRING FRACTURES/RELAXES, CONTAMINATION VALVE SEAT,
HOUSING SEAL FAILURE, PLUNGER JAMS/STICKS, DIAPHRAGM JAMS/STICKS

EFFECTS/RATIONALE:

H2O UP TO 17 PSID PROVIDED THE FEEDWATER TANKS OF THE EMU SHOULD
RESULT IN THE CONDENSATE REGULATOR OPENING AND DRAINING THE TANKS
RESULTING IN AN UNACCEPTABLE CHARGE. MISSION TERMINATION RESULTS
IF SECOND SCU NOT AVAILABLE TO CHARGE FEEDWATER TANKS
WITHOUT DEPLETING THEM. POSSIBLE MISSION IMPACT DUE TO EARLY
BATTERY USAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 350 FLIGHT: 3/2R

ITEM: WATER SUPPLY PRESSURE REGULATOR (ITEM 419)
FAILURE MODE: FAILED CLOSED OR REGULATES LOW (BELOW 8 PSID)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV772190-6

CAUSES: SPRING FRACTURE, CONTAMINATION CAUSES PLUNGER TO
JAM/STICK, DIAPHRAM JAMS/STICKS

EFFECTS/RATIONALE:

UNACCEPATBLE H2O CHARGE PROVIDED THE EMU. MISSION TERMINATION IF
SECOND SCU NOT AVAILABLE FOR CHARGE. POSSIBLE MISSION IMPACT DUE
TO EARLY BATTERY USAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 351 FLIGHT: 3/2R

ITEM: BACTERIA CARTRIDGE (ITEM 423)
FAILURE MODE: INLET SCREEN BLOCKED/NO FLOW (SUPPLY SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV784967-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
LITTLE OR NO FEEDWATER CHARGE. MISSION TERMINATION IF SECOND SCU
UNAVAILABLE. POSSIBLE MISSION IMPACT DUE TO EARLY BATTERY USAGE
REQUIRED TO CHANGE SCU'S.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 352 FLIGHT: 2/2

ITEM: BACTERIA CARTRIDGE (ITEM 423)
FAILURE MODE: INLET SECREEN BLOCKED/NO FLOW (WASTE SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV784967-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:

UNABLE TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS. CAN
RESULT IN H2O CARRYOVER INTO THE PLSS VENT LOOP THEREBY CAUSING
MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 353 FLIGHT: 2/1R

ITEM: BACTERIA CARTRIDGE (ITEM 423)
FAILURE MODE: FAILURE OF CARTRIDGE (SUPPLY OR WASTER) TO CONTROL BACTERIA

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV784967-1

CAUSES: POOR DISTRIBUTION OF FLOW THROUGH IODINE IMPREGNATED BEADS, FAILURE OF SEAL TO BACTERIA FILTER HOUSING

EFFECTS/RATIONALE:

POSSIBLE BACTERIA/FUNGUS GROWTH IN THE EMU CAN RESULT IN BLOCKED FILTERS, INEFFICIENT COOLING, BLOCKED FAN SEPARATOR PITOT VALVE, ETC. ONE OR MORE OF THESE CAN RESULT IN LOSS OF PLSS COOLING AND/OR VENTILATION FUNCTION.

POSSIBLE SOP USEAGE IF BLOCKAGE OCCURS EVA. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 354 FLIGHT: 3/2R

ITEM: POTABLE H2O FILTER (ITEM 424)
FAILURE MODE: BLOCKED/CLOGGED (SUPPLY SIDE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV784959-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:

INABILITY TO CHARGE EMU FEEDWATER TANKS. MISSION TERMINATION
WILL RESULT IF SECOND SCU UNAVAILABLE. POSSIBLE MISSION IMPACT
DUE TO EARLY BATTERY USEAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86
SUBSYSTEM: EMU
MDAC ID: 355

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: POTABLE H2O FILTER (ITEM 424)
FAILURE MODE: BLOCKED/CLOGGED (WASTE SIDE)

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV784959-1

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:

UNABLE TO RELIEVE CONDENSATE GENERATED DURING IV OPERATIONS. CAN
RESULT IN H2O CARRYOVER INTO THE PLSS VENT LOOP THEREBY CAUSING
MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 356 FLIGHT: 3/2R

ITEM: O2 FILTER AND ORIFICE (ITEM 420)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778504-2

CAUSES: INLET/OUTLET SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:

LOWER OVERALL O2 PRESSURE SUPPLIED THE EMU DURING
CHARGE/RECHARGE. INCREASES AIRLOCK O2 CONCENTRATION THEREBY
REQUIRING VENTILATION DUE TO POSSIBLE FIRE HAZARD. MISSION
TERMINATION IF OTHER SCU FAILED AND UNABLE TO COMPLETE O2 CHARGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/08/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 357 FLIGHT: 3/2R

ITEM: O2 FILTER AND ORIFICE (ITEM 420)
FAILURE MODE: FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) SCU
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778504-2

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:
NO OXYGEN PROVIDED THE EMU. MISSION TERMINATION REQUIRED IF
OTHER SCU FAILED AND UNABLE TO PROVIDE O2 CHARGE TO EMU.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 359 FLIGHT: 2/1R

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767706-3

CAUSES: SEAL FAILURE, BOURDON TUBE LEAK

EFFECTS/RATIONALE:

LOSS OF PRIMARY O2. MISSION TERMINATION. IF EVA, POSSIBLE LOSS OF CREWPERSON WITH SOP FAILURE. POSSIBLE HIGH O2 CONCENTRATION IN AIRLOCK REQUIRING VENTILATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 360 FLIGHT: 1/1

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: BOURDON TUBE RUPTURE (VIOLENT)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	1/1
EVA:	1/1
POST-EVA:	1/1

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767706-3

CAUSES: FATIGUE

EFFECTS/RATIONALE:

A VIOLENT RUPTURE OF THE BOURDON TUBE CAN RESULT IN AN OXYGEN
FIRE AND LOSS OF CREWPERSON/VEHICLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 361 FLIGHT: 3/2R

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: SCREEN/VENT(REFERENCE) PORT BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767706-3

CAUSES: EXCESSIVE CONTAMINATION/CORROSION

EFFECTS/RATIONALE:

LOSS OF REFERENCE WHICH, DEPENDENT UPON WHEN IT OCCURRED, COULD
RESULT IN HIGH OR LOW GAGE READING. WITH LOSS OF SUIT PRESSURE
TRANSDUCER 114, MISSION TERMINATION WOULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 362 FLIGHT: 3/2R

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: FAILS HIGH

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767706-3

CAUSES: LINKAGE JAMS/FAILS, BOURDON TUBE RELAXES

EFFECTS/RATIONALE:
CONCURRENT LOSS OF THE 114 TRANSDUCER WOULD RESULT IN MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 363 FLIGHT: 3/2R

ITEM: SUIT PRESSURE GAGE (ITEM 311)
FAILURE MODE: FAILS LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767706-3

CAUSES: LINKAGE JAMS/FAILS, SENSE LINE BLOCKED

EFFECTS/RATIONALE:
CONCURRENT LOSS OF THE 114 TRANSDUCER WOULD RESULT IN MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 364 FLIGHT: 2/1R

ITEM: DCM PURGE VALVE (ITEM 314)
FAILURE MODE: EXTERNAL LEAKAGE/INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV787027-3

CAUSES: SEAL FAILURE, HOUSING SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, LOSS OF CREWPERSON WITH LOSS OF SOP. IF IN AIRLOCK, POSSIBLE HIGH O2 CONCENTRATION WILL REQUIRE VENTILATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 365 FLIGHT: 3/1R

ITEM: DCM PURGE VALVE (ITEM 314)
FAILURE MODE: INLET FILTER BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV787027-3

CAUSES: EXCESSIVE CONTAMINATION

EFFECTS/RATIONALE:

WITH A HELMET CPV FAILURE, NO OR LOW FLOW WILL RESULT IN LOSS OF PURGE CAPABILITY AND THIS SCENARIO FOR LOSS OF REDUNDANCY CAN RESULT IN THE CAPABILITY TO USE THE SOP IN THE EVENT OF A PLSS FAILURE. POSSIBLE LOSS OF CREWPERSON; OTHERWISE, MISSION TERMINATION WILL OCCUR.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 366 FLIGHT: 3/1R

ITEM: DCM PURGE VALVE (ITEM 314)
FAILURE MODE: FAILED CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV787027-3

CAUSES: SPRING FRACTURE, PLUNGER STUCK

EFFECTS/RATIONALE:

WITH A CONCURRENT HELMET CPV FAILURE, ALL PURGE CAPABILITY WOULD BE LOST. LOSS OF THIS CAPABILITY WOULD REQUIRE A PLSS FAILURE BEFORE FAILURE WOULD BE LIFE OR VEHICLE CRITICAL WHEN EVA. OTHERWISE WITH A CPV FAILURE, THE MISSION WILL BE TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 367 FLIGHT: 2/1R

ITEM: DCM PURGE VALVE (ITEM 314)
FAILURE MODE: FAIL OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV787027-3

CAUSES: SPRING FRACTURE, PLUNGER STUCK

EFFECTS/RATIONALE:
LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. IF EVA, LOSS OF
CREWPERSON WITH LOSS OF SOP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 368 FLIGHT: 3/1R

ITEM: DCM PURGE VALVE (ITEM 314)
FAILURE MODE: REDUCED FLOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV787027-3

CAUSES: PARTIAL BLOCKAGE OF FILTER, SPRING FRACTURE REDUCES
PLUNGER TRAVEL

EFFECTS/RATIONALE:

REDUCED FLOW WILL RESULT IN AN INEFFICIENT FLUSH OF THE
CREWPERSON'S ORAL-NASAL AREA AND DECREASED THERMAL EFFECTIVITY
FOR SOP USEAGE DURING EVA-ASSUMES A PLSS FAILURE DURING EVA,
RESULTED IN PURGE VALVE AND SOP OPERATIONS.
IF CPV ALSO FAILED AND FLOW WAS SIGNIFICANTLY LOW FOR DCM PURGE
VALVE, CREWPERSON COULD BE LOST, OTHERWISE, MISSION TERMINATION
WOULD OCCUR.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 369 FLIGHT: 3/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: EXTERNAL LEAKAGE-OXYGEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE, UNMATED: POPPET
STICKS OPEN, UNMATED: RETURN SPRING FRACTURES/RELAXES

EFFECTS/RATIONALE:

HARDWARE ITEM 113A PROVIDES REDUNDANCY IN SEALING PRIMARY O2
SUPPLY OUTLET. HOWEVER, FAILURE DURING EVA COULD, WITH A 113A
FAILURE, RESULTS IN LOSS OF PRIMARY OXYGEN REQUIRING SOP USEAGE
AND MISSION TERMINATION.

POSSIBLE LOSS OF CREWPERSON COULD THEN RESULT WITH AN SOP
FAILURE. FAILURE WITHIN THE AIRLOCK DURING PRE- AND POST-EVA
OPERATIONS COULD RESULT IN A HIGH O2 CONCENTRATION REQUIRING
VENTILATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 370 FLIGHT: 2/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: EXTERNAL LEAKAGE-FEEDWATER SUPPLY/DRAIN LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: SEAL FAILURE, CONNECTOR SEAL FAILURE; UNMATED: POPPET
STICKS OPEN, RETURN SPRING FRACTURE/RELAXES

EFFECTS/RATIONALE:

LOSS OF PLSS FEEDWATER SUPPLY AND COOLING CAPABILITY. RESULTS IN
MISSION TERMINATION A POSSIBLE LOSS OF CREWPERSON WITH SOP
FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 371 FLIGHT: 2/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: EXTERNAL LEAKAGE-LCG INLET-LCG OUTLET

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: SEAL FAILURE, CONNECTOR FAILURE UNMATED :POPPET STICKS
OPEN UNMATED: RETURN SPRING FEATURES/RELAXES

EFFECTS/RATIONALE:

LOSS OF LCG H2O AND FEEDWATER SUPPLY RESULTING IN LOSS OF
COOLING. MISSION TERMINATION AND POSSIBLE LOSS OF CREWPERSON
WITH LOSS OF SOP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 372 FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: FAILS TO MATE TO SCU

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-11

CAUSES: COUPLINGS ARE MISALIGNED, COUPLINGS BIND

EFFECTS/RATIONALE:
UNABLE TO CHARGE OR RECHARGE EMU. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 373 FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: FAILS TO DEMATE FROM SCU

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-11

CAUSES: COUPLINGS BIND, SPRING FRACTURE, CAN BIND

EFFECTS/RATIONALE:
UNABLE TO DETACH SCU. MISSION TERMINATION DUE TO INABILITY TO
LEAVE AIRLOCK.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 374 FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OPEN IN POWER LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONNECTOR DISCONNECTED, TERMINAL
BROKEN

EFFECTS/RATIONALE:
UNABLE TO POWER EMU FOR IV OPERATIONS WITHOUT BATTERY USEAGE.
EARLY BATTERY USEAGE RESULTS IN MISSION DURATION IMPACT DUE TO
LESSER AMOUNT OF POWER RESERVE AVAILABLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 375 FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: SHORT IN POWER LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS
CONNECTOR/CONTACTS

EFFECTS/RATIONALE:

UNABLE TO POWER EMU FOR IV OPERATIONS WITHOUT BATTERY USEAGE.
EARLY BATTERY USEAGE RESULTS IN MISSION IMPACT/TERMINATION DUE TO
LESSER AMOUNT OF POWER RESERVE AVAILABLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 376 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OPEN IN BATTERY RECHARGE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONNECTOR DISCONNECTED, TERMINAL
BROKEN

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO RECHARGE BATTERY UNLESS SECOND EMU IS USED
TO PERFORM RECHARGE. MISSION TERMINATION RESULTS IF SECOND EMU
RECHARGE ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 377 FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: SHORT IN BATTERY RECHARGE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS
CONNECTOR/CONTACTS

EFFECTS/RATIONALE:

UNABLE TO CHARGE/RECHARGE BATTERY UNLESS SECOND EMU IS USED.
HOWEVER, SINCE SHORT WILL EXIST ANY TIME NOT ON BATTERY POWER, NO
CONNECTION TO SCU CAN OCCUR FOR AFFECTED EMU. THEREFORE, MISSION
TERMINATION SHOULD RESULT DUE TO INABILITY TO CHARGE OR
RECHARGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 378 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OPEN IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, TERMINAL BROKEN, CONNECTOR
DISCONNECTED

EFFECTS/RATIONALE:

UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY
BATTERY USE COULD BE A MISSION DURATION IMPACT. SECOND BATTERY
AVAILABLE, BUT IF FAILED MISSION TERMINATION COULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 379 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: SHORT IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR
CONTACTS

EFFECTS/RATIONALE:

UNABLE TO POWER EMU FOR IV OPERATIONS USING VEHICLE POWER. EARLY
BATTERY USE COULD BE A MISSION DURATION IMPACT. SECOND BATTERY
AVAILABLE BUT IF FAILED COULD RESULT IN MISSION TERMINATION.
THIS FAILURE ALSO CAUSE A SLIGHTLY HIGHER LOAD ON THE BATTERY AND
LOSS OF VOLTAGE SENSE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 380

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OPEN IN HARDLINE AUDIO IN/OUT

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, TERMINAL BROKEN, CONNECTOR
DISCONNECTED

EFFECTS/RATIONALE:

UNABLE TO OBTAIN HARDLINE COMMUNICATIONS. MISSION TERMINATION IF
EVC FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 381 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: SHORT IN HARDLINE AUDIO IN/OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: CORROSION, VIBRATION, CONTAMINATION ACROSS CONNECTOR
CONTACTS

EFFECTS/RATIONALE:

UNABLE TO OBTAIN HARDLINE VEHICLE COMMUNICATIONS. MISSION
TERMINATION IF EVC FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 382 FLIGHT: 3/3

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: BATTERY RECHARGE LINE SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: SWITCH CONTACT MECHANISM FAILS/STICKS, ELECTRICAL
WELDING FROM ARCING

EFFECTS/RATIONALE:
NO IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 383 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: BATTERY RECHARGE LINE SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: SWITCH CONTACT MECHANISM FAILS, CONTACT BROKEN,
CORROSION

EFFECTS/RATIONALE:

UNABLE TO RECHARGE BATTERY. POSSIBLE MISSION TERMINATION IF
SECOND EMU CHARGING CAPABILITY FAILS AND SPARE BATTERY NOT
AVAILABLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 384 FLIGHT: 2/2

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: OXYGEN FLOW BLOCKED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: FILTER BLOCKED DUE TO EXCESSIVE CONTAMINANTS

EFFECTS/RATIONALE:

INABILITY TO CHARGE/RECHARGE EMU OXYGEN. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 385 FLIGHT: 3/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: 02 FILTER PASSES CONTAMINANTS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/1R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: FILTER RUPTURES, FILTER SEAL TO HOUSING FAILS

EFFECTS/RATIONALE:

FAILURE OF DOWNSTREAM 113A CHECK VALVE AND FILTERS CAN RESULT IN BLOCKAGE OF THE PRIMARY REGULATOR ASSEMBLY ORIFICE OR REGULATORS. POSSIBLE BLOCKAGE OF THE 113A FILTERS AND, THEREFORE, FAILURE OF PLSS. MISSION TERMINATION WITH POSSIBLE USE OF SOP IF EVA CAN RESULT. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 386 FLIGHT: 3/2R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: LGC IN/OUT VALVE FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	/NA
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778872-11

CAUSES: LINKAGE MECHANISM FAILS/JAMS, CONTAMINATION/DEPOSITION
CORROSION

EFFECTS/RATIONALE:

INEFFICIENT IV OPERATIONS COOLING. POSSIBLY EXPEDITE IV
OPERATIONS TO EMPLOY SUBLIMATOR AT EVA. CREWPERSON DISCOMFORT.
MISSION TERMINATION WITH SUBLIMATOR FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 387 FLIGHT: 2/1R

ITEM: COMMON MULTIPLE CONNECTOR (ITEM 330)
FAILURE MODE: LCG IN/OUT VALVE FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV778872-11

CAUSES: LINKAGE MECHANISM FAILS/JAMS,
CONTAMINATION/DEPOSITION/CORROSION

EFFECTS/RATIONALE:

UNABLE TO OBTAIN EV OPERATIONS COOLANT FLOW PATH FOR LCG H2O
LOOP. CREWPERSON DISCOMFORT. MISSION TERMINATION. POSSIBLE LOSS
OF CREWPERSON WITH LOSS OF SOP IF EVA PERFORMED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 388

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)
FAILURE MODE: VENT LOOP INTERFACE LEAKAGE (P2 OR P3)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV779301-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF PRIMARY OXYGEN. MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 389 FLIGHT: 2/1R

ITEM: HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)
FAILURE MODE: COOLING LOOP INTERFACE LEAKAGE (P4,P5,P6,OR P7)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV779301-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF COOLING EFFICIENCY AND MAKEUP FEEDWATER UNTIL COOLING
FUNCTION LOST. MISSION TERMINATION; POSSIBLE LOSS OF CREWPERSON
IF SOP IS FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 390 FLIGHT: 2/1R

ITEM: HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)
FAILURE MODE: POTABLE H2O LEAKAGE (P8)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV779301-1

CAUSES: SEAL FAILURE

EFFECTS/RATIONALE:
LOSS OF FEEDWATER FOR SUBLIMATOR. COOLING FUNCTION LOST. MISSION
TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP IS FAILED

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 391 FLIGHT: 3/2R

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: SHAFT BINDS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767784-1

CAUSES: CORROSION, BEARINGS BIND, CONTAMINATION CAUSES SHAFT TO BE STUCK

EFFECTS/RATIONALE:

LOSS OF VOLUME CONTROL FOR ONE CHANNEL. IF OTHER CHANNEL IS LOST, MISSION COMPLETION WILL BE DEPENDENT UPON THE VOLUME LEVEL OF THE REMAINING CHANNEL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 392 FLIGHT: 3/2R

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: OPEN IN ONE COMMUNICATIONS LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767784-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CORROSION, CHAFFING, WIPER FRACTURES

EFFECTS/RATIONALE:
LOSS OF VOLUME AND CONTROL FOR PARTICULAR EVC CHANNEL BEING USED.
TOTAL RADIO COMMUNICATIONS LOSS WITH LOSS OF OTHER CHANNEL WILL
RESULT IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 393 FLIGHT: 3/2R

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: SHORT IN ONE COMMUNICATIONS CHANNEL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767784-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CHAFFING, CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF VOLUME FOR ONE EVC CHANNEL. TOTAL RADIO COMMUNICATIONS
LOSS WITH LOSS OF OTHER CHANNEL WILL RESULT IN MISSION
TERMINATION. (NOTE: PROBABLE INCREASE IN VOLUME WILL ACCOMPANY
THIS FAILURE).

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 394 FLIGHT: 2/2

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: SHORT ACROSS TWO COMMUNICATIONS CHANNELS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: SV767784-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CHAFFING, CONTAMINATION

EFFECTS/RATIONALE:
TOTAL LOSS OF RADIO COMMUNICATIONS WILL RESULT IN MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 395 FLIGHT: 3/2R

ITEM: VOLUME CONTROL (ITEM 360)
FAILURE MODE: INCREASED RESISTANCE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767784-1

CAUSES: CORROSION, CONTAMINATION, WIPER WEARS

EFFECTS/RATIONALE:
ASSUMING WORST CASE, HIGH RESISTANCE WILL BE VERY MUCH LIKE AN
OPEN RESULTING IN LOSS OF VOLUME FOR AN EVC CHANNEL. MISSION
TERMINATION CAN RESULT WITH LOSS OF OTHER CHANNEL.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 396 FLIGHT: 2/2

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)
FAILURE MODE: OPEN IN LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:

PART NUMBER: SV767785-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CORROSION, CHAFFING, WIPER FRACTURES

EFFECTS/RATIONALE:

LOSS OF DISPLAY FOR DCM RESULTS IN LOSS OF MISSION TIME, CAUTION AND WARNING MESSAGES, AND OTHER DATA. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 397 FLIGHT: 2/2

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)
FAILURE MODE: SHORT ACROSS DISPLAY LINES

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV767785-1

CAUSES: VIBRATION, CONNECTOR FAILURE, CHAFFING, CONTAMINATION

EFFECTS/RATIONALE:
DISPLAY INTENSITY MAY INCREASE TOO MUCH SUCH THAT THE DISPLAY
COULD NOT BE READ. MISSION TERMINATION WOULD THEN RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 398

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)
FAILURE MODE: INCREASED RESISTANCE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV767785-1

CAUSES: CORROSION, CONTAMINATION, WIPER WEARS

EFFECTS/RATIONALE:

PROBABLE DECREASE IN DISPLAY INTENSITY MAY RESULT IN DISPLAY
BEING UNREADABLE. MISSION TERMINATION WOULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 399 FLIGHT: 2/2

ITEM: DISPLAY INTENSITY CONTROL (ITEM 361)
FAILURE MODE: SHAFT BINDS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV767785-1

CAUSES: CORROSION, BEARINGS BIND, CONTAMINATION CAUSES SHAFT TO BE STUCK

EFFECTS/RATIONALE:
LOSS OF DISPLAY INTENSITY CONTROL. IF INTENSITY SETTING IS NOT ACCEPTABLE FOR THE MISSION, THE DISPLAY WILL BE UNREADABLE AND THE MISSION WOULD BE TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 400 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY HARDLINE (IV COMMUNICATIONS)
POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION FAILURE,
CORROSION DUE TO HERMETIC SEAL FAILURE, LEAD SEVERS FROM
CONNECTION

EFFECTS/RATIONALE:

LOSS OF PRIMARY WILL RESULT IN AUTOMATIC USE OF SECONDARY
CIRCUITRY. COMPLETE LOSS OF IV COMMUNICATIONS WILL NOT IMPACT
RADIO COMMUNICATIONS.
HOWEVER, IF ALL COMMUNICATIONS ARE LOST MISSION IS TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 401 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN SECONDARY HARDLINE (IV COMMUNICATIONS)
POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO
HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:

LOSS OF SECONDARY WILL RESULT IN CONTINUED USE OF PRIMARY
CIRCUITRY. COMPLETE LOSS OF IV COMMUNICATIONS WILL NOT IMPACT
RADIO COMMUNICATIONS.
HOWEVER, COMPLETE LOSS OF COMMUNICATIONS (IV AND EV) WILL RESULT
IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 402 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY MODE A POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO
HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:

LOSS OF MODE A PRIMARY RESULTS IN AUTOMATIC USE OF SECONDARY
CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION
TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 403 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN SECONDARY MODE A POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO
HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:

LOSS OF MODE A SECONDARY RESULTS IN CONTINUED USE OF PRIMARY
CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION
TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 404 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY MODE B POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO
HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF MODE B PRIMARY RESULTS IN AUTOMATIC USE OF SECONDARY
CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION
TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 405 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN SECONDARY MODE B POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO
HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:

LOSS OF MODE B SECONDARY RESULTS IS CONTINUED USE OF PRIMARY
CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION
TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 406

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN PRIMARY BACKUP POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO
HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:
LOSS OF PRIMARY BACKUP RESULTS IN AUTOMATIC USE OF SECONDARY
CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION
TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 407 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: OPEN IN SECONDARY BACKUP POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: CONTACT BROKEN/WORN, WIPER FAILURE, CORROSION DUE TO
HERMETIC SEAL FAILURE, LEAD SEVERS FROM CONNECTION

EFFECTS/RATIONALE:

LOSS OF SECONDARY BACKUP RESULTS IN CONTINUED USE OF PRIMARY
CIRCUITRY. COMPLETE LOSS OF REDUNDANCY WILL RESULT IN MISSION
TERMINATION DUE TO RADIO COMMUNICATIONS LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 408 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SHORT TO GROUND PRIMARY

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTAMINATION, CHAFFING, VIBRATION

EFFECTS/RATIONALE:
LOSS OF PRIMARY CIRCUIT. UPSTREAM CURRENT LIMITER WILL OPERATE.
HARDLINE/RADIO WOULD BE AVAILABLE BY SECONDARY CIRCUIT. IF
SECONDARY CIRCUIT FAILS, MISSION TERMINATION RESULTS DUE TO RADIO
LOSS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 409 FLIGHT: 3/2R

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SHORT TO GROUND SECONDARY

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767786-1

CAUSES: CONTAMINATION, CHAFFING, VIBRATION

EFFECTS/RATIONALE:

LOSS OF SECONDARY CIRCUIT. THE PRIMARY EVC CIRCUIT IS REDUNDANT TO THE SECONDARY AND, IF FAILED, MISSION TERMINATION WOULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 410 FLIGHT: 2/2

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN HARDLINE POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO ARCING, SHAFT STICKS
DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:

UNABLE TO EMPLOY EVC RADIO. MISSION TERMINATION RESULTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 411 FLIGHT: 3/3

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN MODE A POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO ARCING, SHAFT STICKS
DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:

EVC RADIO PERMANENTLY ENGAGED. EVA MISSION CAN BE PERFORMED. IV
HARDLINE OPS MUST BE PERFORMED EMPLOYING RADIO.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 412 FLIGHT: 3/3

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN MODE B POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:

PART NUMBER: SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO ARCING, SHAFT STICKS
DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:

EVC RADIO PERMANENTLY ENGAGED. EVA MISSION CAN BE PERFORMED. IV
HARDLINE OPS MUST BE PERFORMED EMPLOYING RADIO.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 413 FLIGHT: 3/3

ITEM: EVC SELECTOR SWITCH (ITEM 362)
FAILURE MODE: SWITCH FAILS IN BACKUP POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:
PART NUMBER: SV767786-1

CAUSES: BEARINGS BIND, CONTACT WELDS DUE TO ARCING, SHAFT STICKS
DUE TO CONTAMINATION, KNOB TO SHAFT FAILURE

EFFECTS/RATIONALE:
EVC RADIO PERMANENTLY ENGAGED. EVA MISSION CAN BE PERFORMED. IV
HARDLINE OPS MUST BE PERFORMED EMPLOYING RADIO.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 414 FLIGHT: 3/2R

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY CHARGE FROM VEHICLE
(T7 OPEN)-STICKS IN T8 POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE
RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION
FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES-UNABLE TO
CHANGE SWITCH POSITION

EFFECTS/RATIONALE:

UNABLE TO CHARGE BATTERY. WOULD REQUIRE USE OF SECOND EMU TO
CHARGE BATTERY OR A SPARE BATTERY. LOSS OF THESE REDUNDANCIES CAN
RESULT IN MISSION TERMINATION DUE TO INABILITY TO PERFORM POWERED
EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 415 FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY POWER FROM BATTERY
(T8 OPEN)-STICKS IN T7 POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 2/2
POST-EVA: 3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE
RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION
FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES-UNABLE TO
CHANGE SWITCH POSITION

EFFECTS/RATIONALE:

BATTERY POWER UNAVAILABLE TO ELECTRONICS DURING EVA. MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 416 FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY CHARGE CONTACT (T9 OPEN)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	2/2
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES-UNABLE TO CHANGE SWITCH POSITION, CONTACT FAILS

EFFECTS/RATIONALE:
UNABLE TO CHARGE BATTERY. WOULD REQUIRE USE OF SECOND EMU TO CHARGE BATTERY OR A SPARE BATTERY. LOSS OF THESE REDUNDANCIES CAN RESULT IN MISSION TERMINATION DUE TO INABILITY TO PERFORM EVA. BATTERY POWER UNAVAILABLE TO ELECTRONICS DURING EVA. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 417 FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR VEHICLE POWER (T4 OPEN)-
STICKS IN T5 POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE
RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION
FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES-UNABLE TO
CHANGE SWITCH POSITION

EFFECTS/RATIONALE:

LOSS OF VEHICLE POWER FOR IV OPERATIONS. PROBABLE EARLY USE OF
BATTERY POWER WILL IMPACT MISSION DURATION. POSSIBLE MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 418 FLIGHT: 2/1R

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY POWER TO FAN AND TO
DC/DC CONVERTER (T5 OPEN)-STICKS IN T4 POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE
RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION
FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES-UNABLE TO
CHANGE SWITCH POSITION

EFFECTS/RATIONALE:

LOSS OF BATTERY POWERED FAN/PUMP/SEPARATOR AND DC/DC CONVERTER.
CAUSES MISSION TERMINATION. IF EVA, POSSIBLE CREWPERSON LOSS IF
SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 419 FLIGHT: 2/1R

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR FAN POWER AND DC/DC
CONVERTER (T6 OPEN)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: OPPOSITE CONTACT WELDS CLOSED, HERMETIC SEAL FAILURE
RESULTS IN CORROSION OR CONTAMINATION ON CONTACTS, VIBRATION
FRACTURES CONTACT JOINT, LEAF SPRING FRACTURES/RELAXES-UNABLE TO
CHANGE SWITCH POSITION

EFFECTS/RATIONALE:

LOSS OF VEHICLE POWER FOR IV OPERATIONS. PROBABLY EARLY USE OF
BATTERY POWER WILL IMPACT MISSION.
LOSS OF BATTERY POWERED FAN/PUMP/SEPARATOR AND DC/DC CONVERTER
CAUSES MISSION TERMINATION. IF EVA, POSSIBLE CREWPERSON LOSS IF
SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 420 FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN (T1 OPEN)-STICKS IN T2 POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR
CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT,
LEAF SPRING FRACTURES/RELAXES-UNABLE TO CHANGE POSITION OF
SWITCH, OPPOSITE CONTACT WELDS CLOSED

EFFECTS/RATIONALE:

LOSS OF VEHICLE POWER FOR EVC, CLIV, AND FEEDWATER VALVE.
PROBABLE EARLY USE OF BATTERY TO OPERATE THESE ITEMS DURING IV
OPERATIONS. POSSIBLE MISSION DURATION IMPACT DUE TO EARLY BATTERY
USE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 421 FLIGHT: 2/1R

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR BATTERY POWER TO EVC (T2
OPEN)-STICKS IN T1 POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR
CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT,
LEAF SPRING FRACTURES/RELAXES-UNABLE TO CHANGE POSITION OF
SWITCH, OPPOSITE CONTACT WELDS CLOSED

EFFECTS/RATIONALE:

LOSS OF BATTERY POWER FOR EVC, CLIV, AND FEEDWATER VALVE. UNABLE
TO PERFORM EVA DUE TO COOLING LOSS. MISSION TERMINATION. SOP
USEAGE REQUIRED IF EVA. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO
FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 422

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH FAILS OPEN FOR CONTACT TO EVC POWER (T3 OPEN)

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR
CONTAMINATION ON CONTACTS, VIBRATION FRACTURES CONTACT JOINT,
LEAF SPRING FRACTURES/RELAXES-UNABLE TO CHANGE POSITION OF
SWITCH, RELAY FRACTURES

EFFECTS/RATIONALE:

LOSS OF VEHICLE POWER FOR EVC, CLIV, AND FEEDWATER VALVE.
LOSS OF BATTERY FOR EVC, CLIV, AND FEEDWATER VALVE. UNABLE TO
PERFORM EVA. MISSION TERMINATION. SOP USEAGE REQUIRED IF EVA.
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 423 FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH STAYS IN VEHICLE POWER POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: SWITCH MECHANISM JAMS/FRACTURES

EFFECTS/RATIONALE:

UNABLE TO OBTAIN BATTERY POSITION. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 424 FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SWITCH STAYS IN BATTERY POWER POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: SWITCH MECHANISM JAMS/FRACTURES

EFFECTS/RATIONALE:

UNABLE TO OBTAIN VEHICLE POWER POSITION TO CHARGE BATTERY OR
PERFORM IV OPERATIONS. POSSIBLE MISSION IMPACT DUE TO EARLY
BATTERY USEAGE. MISSION TERMINATION IF BATTERY REQUIRES
ADDITIONAL CHARGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 425 FLIGHT: 2/2

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SHORT-VEHICLE POWER (ANY CONTACT) TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV778596-2

CAUSES: CONTAMINATION, VIBRATION/WIRE CHAFFING

EFFECTS/RATIONALE:
UNABLE TO USE EMU ON VEHICLE POWER DURING ANY IV OPERATIONS.
EARLY BATTERY POWER USE IMPACTS MISSION DURATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 426 FLIGHT: 2/1R

ITEM: POWER MODE SELECTOR SWITCH (ITEM 364)
FAILURE MODE: SHORT-BATTERY POWER (ANY CONTACT) TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV778596-2

CAUSES: CONTAMINATION, VIBRATION/WIRE CHAFFING

EFFECTS/RATIONALE:

UNABLE TO EMPLOY BATTERY FOR EVA. DISCHARGE OF BATTERY POWER.
MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO
FAILS WHEN EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 427 FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: OPEN IN PTT POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR
CONTAMINATION, VIBRATION FRACTURES CONTACT JOINT

EFFECTS/RATIONALE:
UNABLE TO EMPLOY PTT POSITION. MISSION TERMINATION DUE TO
COMMUNICATIONS FAILURE IF EITHER OTHER POSITION FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 428 FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: OPEN IN VOX POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR
CONTAMINATION, VIBRATION FRACTURES CONTACT JOINT

EFFECTS/RATIONALE:
UNABLE TO EMPLOY VOX POSITION. MISSION TERMINATION DUE TO
COMMUNICATIONS FAILURE IF PTT POSITION FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 429 FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: OPEN IN RECEIVE POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CORROSION OR
CONTAMINATION, VIBRATION FRACTURES CONTACT JOINT

EFFECTS/RATIONALE:

UNABLE TO RECEIVE ONLY. MISSION TERMINATION WILL RESULT WITH A
VOX POSITION FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 430 FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: SHORT IN PTT POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767794

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION, WIRE
CHAFFING DUE TO VIBRATION CORROSION

EFFECTS/RATIONALE:
UNABLE TO USE PTT POSITION. MOMENTARY (YET SMALL) INCREASE IN
POWER CONSUMPTION. MISSION TERMINATION DUE TO COMMUNICATIONS LOSS
IF VOX FAILURE ALSO OCCURS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 431 FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: SHORT IN RECEIVE POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C' [P]

LOCATION:
PART NUMBER: SV767794-1

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION, WIRE
CHAFFING DUE TO VIBRATION CORROSION

EFFECTS/RATIONALE:
UNABLE TO USE RECEIVE POSITION. INCREASE IN POWER CONSUMPTION
OCCURS. MISSION TERMINATION RESULTS IF COMMUNICATIONS ARE LOST
WITH FAILURE OF VOX POSITION ALSO.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 432 FLIGHT: 3/2R

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: SHORT IN VOX POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767794-1

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION, WIRE
CHAFFING DUE TO VIBRATION, CORROSION

EFFECTS/RATIONALE:

UNABLE TO USE VOX POSITION. INCREASE IN POWER CONSUMPTION OCCURS.
MISSION TERMINATION DUE TO COMMUNICATIONS FAILURE RESULTS IF PTT
ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 433 FLIGHT: 3/3

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: FAIL CLOSED IN VOX POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV767794-1

CAUSES: SPRING FRACTURE JAMS MECHANISM, CAM BINDS, BEARING BINDS

EFFECTS/RATIONALE:

UNABLE TO DISABLE VOICE COMMUNICATIONS. NO IMPACTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 434 FLIGHT: 2/2

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: FAIL CLOSED IN RECEIVE POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: SV767794-1

CAUSES: SPRING FRACTURE JAMS MECHANISM, CAM BINDS, BEARING BINDS

EFFECTS/RATIONALE:
UNABLE TO OBTAIN VOICE COMMUNICATIONS. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 435 FLIGHT: 2/2

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: FAIL CLOSED IN PTT POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: SV767794-1

CAUSES: SPRING FRACTURE JAMS MECHANISM, CAM BINDS, BEARING
BINDS, LATCH FAILURE

EFFECTS/RATIONALE:

UNABLE TO DISABLE VOICE COMMUNICATION. MISSION TERMINATION DUE TO
INABILITY TO RECEIVE COMMUNICATIONS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 436 FLIGHT: 2/2

ITEM: PUSH-TO-TALK SWITCH (ITEM 365)
FAILURE MODE: SWITCH FAILS OPEN ALL POSITIONS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: SV767794-1

CAUSES: MECHANISM FAILURE BETWEEN CONTACTS, HERMETIC SEAL
FAILURE CAUSING CONTAMINATION AND CORROSION

EFFECTS/RATIONALE:
UNABLE TO OBTAIN ANY COMMUNICATIONS VIA THE EVC. MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 437 FLIGHT: 2/1R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: FAN POWER ON CONTACT OPEN/FAILS OFF

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION,
CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM
FAILURE/RELAY FRACTURED

EFFECTS/RATIONALE:

UNABLE TO POWER FAN MOTOR. MISSION TERMINATION. SOP USEAGE
REQUIRED IF EVA. LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 438 FLIGHT: 2/1R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: FAN POWER ON CONTACT SHORT TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION ACROSS
CONTACTS, SWITCH MECHANISM FRACTURES ACROSS CONTACTS

EFFECTS/RATIONALE:

LOSS OF AVAILABLE POWER TO MOTOR. HIGH USE RATE OF BATTERY POWER.
SOP USEAGE REQUIRED IF EVA. MISSION IMPACT/TERMINATION. POSSIBLE
CREWPERSON LOSS IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 439 FLIGHT: 2/2

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: CLIV POWER "OPEN" LINE/CONTACT OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION,
CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:

UNABLE TO OPEN CLIV. UNABLE TO CHARGE/RECHARGE EMU. MISSION
TERMINATION WOULD RESULT. (THE VALVE IS ONLY PLACED TO THE "OPEN"
POSITION PRIOR TO EVA). DURING EVA, SINCE THE VALVE IS NOT SPRING
LOADED, AN OPEN WOULD HAVE NO EFFECT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 440 FLIGHT: 3/2R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: CLIV POWER "CLOSE" LINE/CONTACT OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/3
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION,
CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:

VALVE REMAINS OPEN. NO IMMEDIATE IMPACT UNLESS A SECOND FAILURE
(THE 134 CHECK VALVE COULD FAIL OPEN) RESULTS TO ALLOW FLOODING
OF VENT LOOP DURING CHARGING. IF THIS OCCURRED, THE PLANNED OR
FUTURE EVA MISSIONS WOULD BE TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 441 FLIGHT: 2/2

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: CLIV POWER SHORT TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CORROSION/CONTAMINATION TO
CAUSE A SHORT, VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:

THE POWER TO THE CLIV IS CURRENT-LIMITED AND SHOULD LIGHTLY LOAD
THE BATTERY. SUCH A SHORT CAN RESULT IN THE CLIV BEING STUCK IN
POSITION, THE WORST OF WHICH IS CLOSED, THEREBY INHIBITING LCG
CHARGING/RECHARGING FOR THE PRE OR POST EVA.

THE MISSION WILL BE TERMINATED. IF EVA, A FAILURE OF THE LCG
PRESSURE INTEGRITY CAN RESULT IN DEGRADED COOLING AND MISSION
TERMINATION DUE TO INABILITY TO MAKE-UP H2O. MISSION DURATION
CAN BE IMPACTED DUE TO THE SLIGHTLY HIGHER POWER USEAGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 442 FLIGHT: 2/1R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: FAN POWER SHORT TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771887-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION
ACROSS LEADS, VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:
LOSS OF FAN MOTOR ASSEMBLY. INCREASED DEMAND ON BATTERY POWER.
SOP USEAGE REQUIRED IF EVA. MISSION TERMINATION. POSSIBLE LOSS
OF CREWPERSON WITH SOP FAILURE IF EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 443

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: SWITCH FAILS OFF

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV771887-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR
FAILS/FRACTURES

EFFECTS/RATIONALE:

NO POWER AVAILABLE TO FAN OR VALVE. MISSION TERMINATION. IF EVA,
SOP USAGE REQUIRED AND POSSIBLE LOSS OF CREWPERSON WITH FAILURE
OF SOP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 444 FLIGHT: 3/3

ITEM: FAN SWITCH (ITEM 366)
FAILURE MODE: SWITCH FAILS ON

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV771887-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR
FAILS/FRACTURES

EFFECTS/RATIONALE:
MISSION CAN BE PERFORMED BUT ON/OFF CAPABILITY OF SWITCH WILL BE
VIA CONNECTION/DISCONNECTION OF SCU POWER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 445 FLIGHT: 2/1R

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL OPEN ON FEEDWATER OPEN LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION,
CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:
FEEDWATER VALVE REMAINS CLOSED. NO COOLING AVAILABLE TO THE
CREWPERSON. IF DETECTED PRE-EVA OR POST-EVA MISSION TERMINATION
RESULTS. IF EVA, MISSION IS TERMINATED AND POSSIBLE LOSS OF
CREWPERSON CAN RESULT IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 446 FLIGHT: 2/2

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL OPEN ON FEEDWATER CLOSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION,
CONTACT FRACTURED DUE TO VIBRATION, SWITCH MECHANISM FAILURE

EFFECTS/RATIONALE:

WORST CASE IS FOR POST-EVA WHEN THE SUBLIMATOR, UNABLE TO CLOSE,
CAN BE FLOODED RESULTING IN POSSIBLE LOSS OF FUTURE MISSIONS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 447 FLIGHT: 2/1R

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL SHORT ON FEEDWATER OPEN LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION ACROSS LEADS,
VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:

POWER IS CURRENT LIMITED. VALVE OPERATION IS PROBABLY IMPAIRED.
VALVE MAY REMAIN CLOSED. MISSION TERMINATION. IF OCCURRENCE OF
FAILED CLOSED OR SHORT IS TO "CLOSED" LINE IS DURING EVA,
THE EMU WILL LOSE ALL COOLING AND POSSIBLE LOSS OF CREWPERSON CAN
RESULT IF SOP ALSO FAILS. POSSIBLE MISSION DURATION IMPACT DUE
TO HIGHER THAN NORMAL USE OF BATTERY POWER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 448 FLIGHT: 2/2

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: ELECTRICAL SHORT ON FEEDWATER CLOSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/2R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767795-2

CAUSES: HERMETIC SEAL FAILURE CAUSE CONTAMINATION ACROSS LEADS,
VIBRATION, WIRE CHAFFING

EFFECTS/RATIONALE:
POWER IS CURRENT LIMITED. VALVE OPERATION IS PROBABLY IMPAIRED
SUCH THAT VALVE MAY REMAIN OPEN CAUSING POST-EVA SUBLIMATOR
FLOODING AND TERMINATION OF FUTURE MISSION. IF SHORT IS TO OPEN
LINE SUBLIMATOR MAY BE FLOODED PRE-EVA RESULTING IN MISSION
TERMINATION. IF CURRENT LIMITER FAILS, HIGHER THAN NORMAL USE OF
BATTERY POWER COULD REDUCE MISSION DURATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 449 FLIGHT: 2/1R

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: SWITCH FAILS IN THE CLOSED POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV767795-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR
FAILS/FRACTURES

EFFECTS/RATIONALE:

UNABLE TO PERFORM EMU COOLING VIA SUBLIMATOR. MISSION
TERMINATION. POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS DURING
THE EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 450 FLIGHT: 2/2

ITEM: FEEDWATER VALVE SWITCH (ITEM 367)
FAILURE MODE: SWITCH FAILS IN THE OPEN POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	3/3
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV767795-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION, ROTOR
FAILS/FRACTURES

EFFECTS/RATIONALE:

OPEN POSITION IS ACCEPTABLE FOR EVA; HOWEVER, IN THE AIRLOCK THIS
FAILURE CAN RESULT IN FLOODING THE SUBLIMATOR AND MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 451 FLIGHT: 2/2

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: OPEN IN STATUS LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:

PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION ON
CONTACTS, CONTACT FRACTURED DUE TO VIBRATION

EFFECTS/RATIONALE:

UNABLE TO OBTAIN CAUTION AND WARNING STATUS AND LOSS OF VISUAL
MISSION STATUS. MISSION TERMINATION DUE TO THESE LOSSES RESULTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 452 FLIGHT: 2/2

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: OPEN IN PROGRAM LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [NA]

LOCATION:

PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE CAUSES CONTAMINATION/CORROSION ON
CONTACTS, CONTACT FRACTURED DUE TO VIBRATION

EFFECTS/RATIONALE:

UNABLE TO EMPLOY LOGIC PROGRAM FOR IV OPERATIONS. ALSO, UNABLE TO
ACKNOWLEDGE CAUTION AND WARNING SIGNAL THEREBY MAINTAINING
HIGHEST PRIORITY SIGNAL ON DISPLAY AND POSSIBLY MASKING OTHER
SIGNALS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 453 FLIGHT: 2/1R

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: SHORT TO GROUND IN STATUS LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION/COOROSION
CAUSING SHORT, WIRE CHAFFING, VIBRATION

EFFECTS/RATIONALE:

SHORT IN THE SWITCH WILL RESULT IN THE DC-DC CONVERTER (WHICH
PROVIDES THE POWER) SHUTTING DOWN. THIS WILL DEPRIVE THE MAJORITY
OF THE EMU OF POWER AND MONITORING. POSSIBLE LOSS OF CREWPERSON
CAN RESULT IF SOP FAILS DURING EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 454 FLIGHT: 2/1R

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: SHORT TO GROUND IN PROGRAM LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV767792-2

CAUSES: HERMETIC SEAL FAILURE RESULTS IN CONTAMINATION/COOROSION
CAUSING SHORT, WIRE CHAFFING, VIBRATION

EFFECTS/RATIONALE:

SHORT IN THE SWITCH WILL RESULT IN THE DC-DC CONVERTER (WHICH PROVIDES THE POWER) SHUTTING DOWN. THIS WILL DEPRIVE THE MAJORITY OF THE EMU OF POWER AND MONITORING. POSSIBLE LOSS OF CREWPERSON CAN RESULT IF SOP FAILS DURING EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 455 FLIGHT: 2/2

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: BEARING FAILS IN "STATUS" POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV767792-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION

EFFECTS/RATIONALE:
UNABLE TO EMPLOY PROGRAM FOR IV OPERATIONS. ALSO UNABLE TO
ACKNOWLEDGE CAUTION AND WARNING THEREBY MAINTAINING HIGHEST
PRIORITY SIGNAL ON DISPLAY AND POSSIBLY MASKING OTHER SIGNALS.
TERMINATE MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 456 FLIGHT: 2/2

ITEM: CAUTION AND WARNING SWITCH (ITEM 368)
FAILURE MODE: SWITCH FAILS IN "PROGRAM" POSITION

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV767792-2

CAUSES: BEARING BINDS, CAM BINDS, CORROSION

EFFECTS/RATIONALE:
UNABLE TO OBTAIN CAUTION AND WARNING AND MISSION STATUS. MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 457 FLIGHT: 2/2

ITEM: BITE INDICATOR (ITEM 363)
FAILURE MODE: OPEN IN ELECTRICAL INPUT/FAILED OFF

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV722651

CAUSES: CORROSION, FRACTURED CONTACT TO LIGHT SOURCE

EFFECTS/RATIONALE:

WILL RESULT IN NO LIGHT INDICATION OF CAUTION AND WARNING FAILURE. A TONE MAY OCCUR BUT THIS TOO CAN BE CONSTRUED AS A FAILURE BY THE CREWPERSON. IF DETECTED, THE MISSION SHOULD TERMINATE.

(NOTE: THE BITE LITE IS TO BE DELETED IN THE FUTURE, IF THIS OCCURS NO IMPACT WILL RESULT OTHER THAN GREATER DEPENDENCE UPON THE TONE.)

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 458 FLIGHT: 2/2

ITEM: BITE INDICATOR (ITEM 363)
FAILURE MODE: SHORT TO BITE INDICATOR CIRCUIT/FAILED ON

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV722651

CAUSES: CONTAMINATION ACROSS CONTACTS, FAILED ELECTRONICS

EFFECTS/RATIONALE:

CONTINUOUS LIGHT ON INDICATING CAUTION AND WARNING FAILURE;
HOWEVER, IT IS NOT ACCOMPANIED BY THE TONE. SINCE FAILURE IS NOT
ISOLABLE AND MAY MASK A TRUE FAILURE, THE MISSION SHOULD BE
TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 459 FLIGHT: 2/2

ITEM: ALPHANUMERIC DISPLAY (ITEM 369)
FAILURE MODE: SUPPLY VOLTAGE (VCC) OPEN TO ALL THREE
CHIPS/DISPLAY FAILS OFF TOTALLY

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: SV791145-1&2

CAUSES: VIBRATION/FRACTURING, CORROSION, PIN-CONTACT FAILURE,
THERMAL CYCLING DUE TO HEAT SINK FAILURE

EFFECTS/RATIONALE:

LOSS OF ENTIRE DISPLAY FOR IV AND MISSION OPERATIONS AND CAUTION
AND WARNING. TONES REMAIN. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/10/86
SUBSYSTEM: EMU
MDAC ID: 460

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: ALPHANUMERIC DISPLAY (ITEM 369)
FAILURE MODE: ERRATIC DISPLAY/LED DRIVER OR COLUMN DRIVER
FAILURE

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: SV791145-1&2

CAUSES: THERMAL DAMAGE TO ELECTRONICS DUE TO HEAT SINK FAILURE,
VIBRATION, CORROSION ON INPUT CONTACTS, OPEN ON CLOCK SIGNAL,
DATA IN CONTACT OPEN/CORRODED

EFFECTS/RATIONALE:

LOSS OF ONE OR MORE OF THE THREE PARTS OF THE DISPLAY CAN BE
EQUATED TO A NON-USEABLE DISPLAY AND, THEREFORE, MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 461 FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: DISPLAY I/O PORT FAILS OFF

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV785970-5

CAUSES: ELECTRONICS FAILURE, VIBRATION/CORROSION, THERMAL
CYCLING CAUSES FAILURE

EFFECTS/RATIONALE:
LOSS OF DISPLAY CAPABILITY FOR CAUTION AND WARNING. TONE
GENERATOR REMAINS. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 462 FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: MEMORY 5.V POWER-IN FAILURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: SV785970-5

CAUSES: VIBRATION CAUSES OPEN, THERMAL CYCLING STRESS
ELECTRONICS, SHORT DUE TO CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF MEMORY USE FOR CAUTION AND WARNING AND CPU IMPACT.
POSSIBLE LOSS OF CAUTION AND WARNING FUNCTION. MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 463 FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: SYSTEM CLOCK OUTPUT OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV785970-5

CAUSES: THERMAL CYCLING CAUSES OPEN, VIBRATION, CORROSION

EFFECTS/RATIONALE:
CAUTION AND WARNING CPU FAILURE. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 464 FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: MULTIPLEXER INPUT POWER FAILURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: SV785970-5

CAUSES: THERMAL CYCLING CAUSES OPEN, VIBRATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF MOST DATA MONITORED/SENSED IN EMU. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 465 FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: ANALOG TO DIGITAL CONVERTER FAILURE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV785970-5

CAUSES: ELECTRONICS FAILURE, THERMAL CYCLING STRESSES
ELECTRONICS, REFERENCE VOLTAGE INPUT SHORTS/OPENS

EFFECTS/RATIONALE:
LOSS OF CAPABILITY TO DETERMINE ENGINEERING UNITS FOR VARIOUS
ANALOG PARAMETERS AND THEIR SUBSEQUENT DISPLAY USEAGE AND CAUTION
AND WARNING USEAGE. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 466 FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: BITE CIRCUIT FAILS ON

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV785970-5

CAUSES: VIBRATION CAUSES SHORT, ELECTRONICS FAILURE,
CONTAMINATION CAUSES SHORT

EFFECTS/RATIONALE:
BITE LITE ON WITHOUT ACCOMPANYING TONE. THIS WILL REQUIRE
JUDGMENT CALL BY CREWPERSON TO DETERMINE FAILURE. MAY POSSIBLY
MASK SUBSEQUENT FAILURE. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 467 FLIGHT: 2/2

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: BITE CIRCUIT FAILS OFF

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: SV785970-5

CAUSES: OPEN IN CIRCUITRY, ELECTRONICS FAILURE, CORROSION

EFFECTS/RATIONALE:

IF THE CIRCUIT WERE REQUIRED, THE TONE GENERATOR WOULD ANNUNCIATE ITSELF BUT NOT BE ACCOMPANIED BY THE BITE LITE OR A FAILURE MESSAGE WILL REQUIRE A CREWPERSON JUDGMENT CALL REGARDING FAILURE. MISSION TERMINATION WOULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 468 FLIGHT: 3/3

ITEM: CAUTION AND WARNING ELECTRONICS (ITEM 150)
FAILURE MODE: UART FAILS

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) C&W
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV785970-5

CAUSES: THERMAL CYCLING CAUSES OPEN, VIBRATION CAUSES OPEN,
CORROSION

EFFECTS/RATIONALE:
LOSS OF C&W RTDS DATA INTERFACE. NO IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 469 FLIGHT: 3/3

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN CURRENT SENSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: 3/3
POST-EVA: 3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CORROSION, VIBRATION

EFFECTS/RATIONALE:
NO IMPACTS. LOSS OF C&W CURRENT MONITORING CAPABILITY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 470 FLIGHT: 3/2R

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN CURRENT SENSE TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
SMALL INCREASE IN LOAD ON BATTERY CAN RESULT IN POSSIBLE IMPACT
TO MISSION DURATION. LOSS OF C&W CURRENT MONITORING CAPABILITY.
IF BATTERY IS DRAWN DOWN, MISSION TERMINATION WILL RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 471 FLIGHT: 3/3

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN VOLTAGE SENSE LINE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CORROSION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF VOLTAGE MONITORING CAPABILITY. NO IMPACTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 472 FLIGHT: 3/2R

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN VOLTAGE SENSE LINE TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF VOLTAGE MONITORING CAPABILITY. SMALL LOAD MAY EFFECT
BATTERY FOR MISSION DURATION. MISSION TERMINATION IF BATTERY
FAILS ALSO.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 473 FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EMI FILTER SHORTS TO GROUND

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: WIRE CHAFFING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

SCU POWER-IN IS CURRENT LIMITED FROM THE ORBITER AND CIRCUIT PROTECTED. LOSS OF SCU POWER TO EMU IS THE RESULT. EARLY USEAGE OF BATTERY POWER IS NECESSARY TO PERFORM MISSION ALTHOUGH EARLY USE CAN IMPACT MISSION DURATION. SPARE BATTERY AVAILABLE FOR USE IF FULL MISSION DURATION REQUIRED. IF SPARE IS FAILED, THE MISSION IS PROBABLE IMPACTED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 474

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EMI FILTER OPEN ELECTRICALLY

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF SCU POWER TO EMU. EARLY USEAGE OF BATTERY POWER IS NECESSARY TO PERFORM MISSION ALTHOUGH EARLY USE CAN IMPACT MISSION DURATION. SPARE BATTERY AVAILABLE FOR USE IF FULL MISSION DURATION REQUIRED.
IF SPARE IS FAILED MISSION IS PROBABLY IMPACTED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 475 FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV-CURRENT LIMITER SHORTS TO GROUND
AT INLET

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

SHORT IMPOSED ON SCU/BATTERY POWER INLET CAUSING INCREASED LOAD ON SOURCE AND LOSS OF EVC PRIMARY CURRENT LIMITER & THE CLIV POWER FOR POSITION CHANGE. MISSION TERMINATION. IF EVA, INCREASED LOAD ON BATTERY WHEN COMBINED WITH AN SOP FAILURE CAN RESULT IN LOSS OF VENT LOOP AND LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 476 FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV CURRENT LIMITER SHORTS TO GROUND
AT EVC PRI POWER OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:
SHORT RESULTS IN CURRENT LIMITATION OCCURING ON OUTLET AND LOSS
OF EVC PRI POWER. MISSION TERMINATES IF EVC SEC FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 477 FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORTS TO
GROUND AT INLET

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

SHORT ON SCU/BATTERY POWER INLET CAUSES INCREASED LOAD ON SOURCE
AND LOSS OF THE EVC SECONDARY AND POWER FOR FEEDWATER VALVE
POSITION CHANGE. MISSION TERMINATION. IF EVA, INCREASED LOAD ON
BATTERY, WHEN COMBINED WITH AN SOP FAILURE, CAN RESULT IN LOSS OF
VENT LOOP AND LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 478 FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORTS TO
GROUND AT EVC SEC POWER

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

SHORT RESULTS IN CURRENT LIMITATION ON OUTLET AND LOSS OF EVC SEC
POWER. MISSION TERMINATES IF EVC PRI FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 479 FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV CURRENT LIMITER SHORTS TO GROUND
AT CLIV POWER OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

SHORT RESULTS IN CURRENT LIMITATION ON OUTLET AND LOSS OF CLIV POWER. CLIV FAIL IN POWER. WORST-CASE POSITION IS CLOSED IN THAT NO MAKEUP WATER TO LCG IS AVAILABLE, SUCH THAT OVER THE MISSION, COOLING EFFICIENCY DECREASES AS LCG BECOMES FULL DEGASSED. MISSION TERMINATION. POSSIBLE CREWPERSON LOSS IF SOP ALSO FAILS DURING EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 480

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORTS TO
GROUND AT FEEDWATER VALVE POWER OUT

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF COOLING FUNCTION OF SUBLIMATOR IF VALVE IS CLOSED.
MISSION TERMINATION. POSSIBLE CREWPERSON LOSS WITH LOSS OF SOP
DURING EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 481 FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRI/CLIV CURRENT LIMITER HAS ELECTRICAL OPEN
ON POWER IN OR POWER OUT LINE FOR CLIV

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF CLIV OPERATIONAL CAPABILITY. IF CLOSED, MISSION MUST TERMINATE AND LCG CANNOT BE CHARGED/RECHARGED. IF EVA; THE CLIV IS NORMALLY OPEN TO PROVIDE MAKEUP WATER TO THE LCG; BUT IF IT HAD FAILED CLOSED, GRADUAL COOLING LOSS WOULD RESULT IN MISSION TERMINATION AND POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 482

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER HAS
ELECTRICAL OPEN ON EVC SEC POWER OUT

LEAD ANALYST: G. RAFFAELLI

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF EVC SEC POWER. MISSION IMPACT IF EVC PRI POWER FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 483 FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC SEC/FEEDWATER VALVE CURRENT LIMITER HAS
ELECTRICAL OPEN ON FEEDWATER VALVE POWER IN/OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:

INABILITY TO CHANGE FEEDWATER VALVE POSITION. IF PRE-EVA, MISSION
TERMINATED DUE TO NO EVA COOLING CAPABILITY. IF EVA, LOSS OF
FEEDWATER CONTROL TO OPEN WOULD RESULT IN MISSION TERMINATION AND
POSSIBLE LOSS OF CREWPERSON IF SOP ALSO FAILED.
IF POST-EVA, BEING UNABLE TO CLOSE VALVE CAN CAUSE THE SUBLIMATOR
AND VENT LOOP TO FLOOD.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 484 FLIGHT: 3/2R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: EVC PRIMARY/CLIV CURRENT LIMITER HAS ELECTRICAL
OPEN ON EVC PRI POWER OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF EVC PRIMARY POWER. MISSION TERMINATION IF EVC SEC POWER
ALSO FAILS.

REFERENCES:

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 485

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: OPEN IN POWER IN TO DC/DC CONVERTER TAP T1

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF 18 VOLT OUTPUT AND 3.8-VOLT OUTPUT. 18 VOLT OUTPUT IS NOT USED. THE 3.8V OUTPUT LOSS WOULD RESULT IN LOSS OF THE DISPLAY COLUMN DRIVERS AND THEREFORE THE DISPLAY. MISSION TERMINATION WOULD RESULT. ALSO, THIS LOSS WOULD FAIL THE SUIT PRESSURE GAGE LIGHT AND THE BITE INDICATOR LIGHT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 486 FLIGHT: 2/2

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: OPEN IN POWER IN TO DC/DC CONVERTER TQP T3

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF +14.2V, 12V, 5.6V, AND 5.0V OUTPUTS. IMMEDIATE LOSS OF
STATUS FOR FEEDWATER VALVE, FAN, VEHICLE POWER AND BATTERY POWER,
AND BITE; ALSO, LOSS OF DISPLAY CONTROL AND VARIOUS TRANSDUCERS
AND SENSORS, THE RTDS, AND VARIOUS OTHER SENSE CIRCUITS.
MAJOR LOSS OF INSTRUMENTATION AND CAUTION AND WARNING. MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 487 FLIGHT: 2/2

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: OPEN IN POWER IN TO DC/DC CONVERTER TAP 2

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF DC/DC CONVERTER FUNCTION WHICH SUPPORTS THE DCM
ELECTRONICS CWS, RTDS, DISPLAY, AND MONITORING. MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 488 FLIGHT: 2/1R

ITEM: DCM ELECTRONICS (ITEM 350)
FAILURE MODE: SHORT TO GROUND IN ANY DC/DC CONVERTER INPUT LINE
(DOWNSTREAM OF CONVERTER CURRENT LIMITER)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

CURRENT LIMITING TO DC/DC CONVERTER RESULTS WITH LOSS OF
CONVERTER FUNCTION WHILE CONSTANT RATE OF DRAIN ON BATTERY
OCCURS. MISSION TERMINATION. POSSIBLE CREWPERSON LOSS IF POWER
DEGRADES AND SOP ALSO FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 489 FLIGHT: 2/1R

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT TO GROUND AT INPUT OF DC/DC CONVERTER
CURRENT LIMITER

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

DRAIN ON SCU/BATTERY POWER SOURCE. DEGRADATION OF DC/DC CONVERTER
FUNCTION SUCH THAT FUNCTION IS IN EFFECT LOST. MISSION
TERMINATION. POSSIBLE CREWPERSON LOSS IF BATTERY FAILS AND SOP IS
ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 490 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT TO GROUND ON DC/DC CONVERTER 5V DC OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF DISPLAY DUE TO LOSS (DEGRADATION) OF 5V POWER TO COLUMN DRIVERS AND LOGIC. WITH NO DISPLAY AVAILABLE MISSION TERMINATION IS REQUIRED. ALSO, CONVERTER WILL SHUT DOWN DUE TO CURRENT DRAW.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 491 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN DC/DC CONVERTER 5V DC OUT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF DISPLAY DUE TO LOSS (DEGRADATION) OF 5V POWER TO COLUMN
DRIVERS AND DISPLAY LOGIC. WITH NO DISPLAY AVAILABLE MISSION
TERMINATION IS REQUIRED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 492 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN +14.2V OUT (FROM DC/DC CONVERTER)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:
LOSS OF C&W REFERENCE VOLTAGE AND POWER FOR VARIOUS C&W BUFFERS,
MULTIPLEXERS, AND SENSORS. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 493 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN 3.8V OUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CORROSION

EFFECTS/RATIONALE:

LOSS OF DISPLAY DUE TO FAILURE/DEGRADATION OF POWER TO DISPLAY COLUMN DRIVERS. ALSO, LOSS OF SUIT PRESSURE GAGE LIGHT AND BITE INDICATOR. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 494 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN 3.8V OUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

LOSS OF DISPLAY DUE TO FAILURE/DEGRADATION OF POWER TO DISPLAY COLUMN DRIVERS. ALSO, LOSS OF SUIT PRESSURE GAGE LIGHT AND BITE INDICATOR. MISSION TERMINATION. CONVERTER SHUTDOWN DUE TO CURRENT LIMITER TRIP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 495 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN +14.2V OUT (FROM DC/DC CONVERTER)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, VIBRATION, CONTAMINATION

EFFECTS/RATIONALE:

LOSS/DEGRADATION OF C&W REFERENCE VOLTAGE AND POWER FOR VARIOUS C&W BUFFERS, MULTIPLEXERS, AND SENSORS. MISSION TERMINATION. ALSO, THE CONVERTER WILL SHUTDOWN DUE TO CURRENT LIMITER TRIP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 496

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/3

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN 18V OUTPUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CONTAMINATION VIBRATION

EFFECTS/RATIONALE:
18-VOLT OUTPUT IS NOT USED IN DCM ELECTRONICS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 497 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: SHORT IN 18V OUTPUT FROM DC/DC CONVERTER

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CONTAMINATION, VIBRATION

EFFECTS/RATIONALE:
CONVERTER SHUTDOWN DUE TO CURRENT LIMITER TRIP. MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 498 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: OPEN IN LINE TO TONE GENERATOR

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV792291

CAUSES: THERMAL CYCLING, CORROSION, VIBRATION

EFFECTS/RATIONALE:
LOSS OF WARNING TONES AND STATUS TONES. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 499 FLIGHT: 2/2

ITEM: DCM ELECTRONICS
FAILURE MODE: FAILED ON TONE GENERATOR

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV792291

CAUSES: ELECTRONICS FAILURE

EFFECTS/RATIONALE:
CONSTANT TONES TO CREWPERSON WILL CAUSE MISSION TERMINATION DUE
TO CREWMEMBER DISCOMFORT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 500 FLIGHT: 2/1R

ITEM: COOLING CONTROL VALVE (ITEM 321)
FAILURE MODE: EXTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV789693

CAUSES: HOUSING SEAL FAILURE, SEAL FAILURE TO COOLANT LOOPS

EFFECTS/RATIONALE:

DURING PRE- AND POST-EVA, LOSS OF COOLANT WATER RESULTS IN INSUFFICIENT COOLING AND POSSIBLE DIFFICULTY IN CHARGE/RECHARGE OPERATIONS. DURING EVA, LOSS OF COOLANT WATER RESULTS IN A LIKE LOSS OF FEOWATER (DUE TO MAKEUP REQUIREMENTS) UNTIL SUPPLY IS EXHAUSTED. MISSION TERMINATION. POSSIBLE SOP USEAGE REQUIRED IF EVA. POSSIBLE CREWPERSON LOSS IF SOP FAILS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 501 FLIGHT: 2/1R

ITEM: COOLING CONTROL VALVE (ITEM 321)
FAILURE MODE: INTERNAL LEAKAGE

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: SV789693

CAUSES: SPOOL SEAL FAILURE

EFFECTS/RATIONALE:

LOSS OF HIGH-FIDELITY COOLING CONTROL. POSSIBLE CREWPERSON DISCOMFORT. POSSIBLE MISSION TERMINTION. IF HEAT LOAD TOO HIGH, CREWPERSON MAY REQUIRE USE OF SOP. POSSIBLE CREWPERSON LOSS WITH SOP FAILURE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 502 FLIGHT: 2/1R

ITEM: COOLING CONTROL VALVE (ITEM 321)
FAILURE MODE: JAMS FULL COLD OR FULL HOT

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) DCM
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV789693

CAUSES: CONTAMINATION OR CORROSION ON STEM/DRUM

EFFECTS/RATIONALE:
CREWPERSON SUBJECTED TO FULL COLD OR MAJOR LOSS OF COOLING.
MISSION TERMINATION. POSSIBLE LOSS OF CREWPERSON WITH LOSS OF SOP
IF EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 503 FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY (115)
FAILURE MODE: "IV" POSITION SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY

EFFECTS/RATIONALE:

UNABLE TO EMPLOY IV PROGRAM SEQUENCE WHICH WOULD TRIGGER ON THIS INDICATOR. VISUAL INSPECTION AND PRESSURE VALVES AVAILABLE. NO MISSION IMPACT. EVA POSITION IS DETERMINED VIA A DIFFERENT SWITCH.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 504 FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY (115)
FAILURE MODE: "OFF" POSITION SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY

EFFECTS/RATIONALE:

UNABLE TO VERIFY BY POSITION SWITCH, ACTUATOR IN OFF POSITION.
VISUAL INSPECTION AND GRADUAL PRESSURE DECAY WOULD SO INDICATE
THE POSITION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 505 FLIGHT: 3/2R

ITEM: SHEAR PLATE ASSEMBLY (115)
FAILURE MODE: "PRESS" POSITION SWITCH FAILS CLOSED

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF RELAY

EFFECTS/RATIONALE:

PRESS POSITION WOULD BE VERIFIABLE VISUALLY AND BY SUIT PRESSURE VALUE; HOWEVER, FAILURE TO OPEN WOULD IMPACT EMU CAPABILITY TO PERFORM THE LEAK CHECK FOR PRESSURE INTEGRITY. ALSO, IV PROGRAMMED OPERATIONS WILL BE IMPACTED.
POSSIBLE MISSION IMPACT IF SUIT LEAKS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86
SUBSYSTEM: EMU
MDAC ID: 506

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: IV POSITION SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF
RELAY/FRACTURES, LEAD CHAFFES OPEN

EFFECTS/RATIONALE: SIGNAL WILL APPEAR TO ELECTRONICS AS IF IN "PRESS" POSITION WHEN
IN "OFF" POSITION. NO IMPACT TO LEAK CHECK IN PRESS, ALTHOUGH IT
MAY CAUSE ERRORS IN IV PROGRAMMED OPERATIONS. EVA POSITION IS BY
AN ALTERNATE SWITCH.
VISUAL VERIFICATIONS AVAILABLE IN ADDITION TO PRESSURE VALUES.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 507 FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: OFF POSITION SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF
RELAY/FRACTURES, LEAD CHAFFES OPEN

EFFECTS/RATIONALE:

SIGNAL WILL APPEAR TO ELECTRONICS AS IF IN "PRESS" POSITION WHEN
IN "IV" POSITION. POSSIBLE IV PREPROGRAMMED OPERATIONS ERRORS MAY
RESULT. LEAK CHECK IN PRESS POSITION WOULD STILL BE VALID.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/16/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 508 FLIGHT: 3/3

ITEM: SHEAR PLATE ASSEMBLY
FAILURE MODE: PRESS POSITION SWITCH FAILS OPEN

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) PLSS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: CONTAMINATION, CORROSION, MECHANICAL FAILURE OF
RELAY/FRACTURES, LEAD CHAFFES OPEN

EFFECTS/RATIONALE:
UNABLE TO PERFORM IV PROGRAMMED SEQUENCES APPLICABLE TO IV
POSITION. NO IMPACT TO OBTAINING POSITIONS FOR REGULATOR. NO
MISSION IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 509 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: +14V HL REGULATOR FAILS HIGH/LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, CONTAMINATION, SHORT

EFFECTS/RATIONALE:
LOSS OF HANDLING COMMUNICATIONS. REQUIRES LOSS OF REDUNDANT
RADIO COMMUNICATIONS FOR LOSS OF MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 510 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: +14V A, BU REGULATOR FAILS HIGH/LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, CONTAMINATION, SHORT

EFFECTS/RATIONALE:
LOSS OF ONE TRANSMITTER/RECEIVER SET. IF REDUNDANT SETS FAIL,
MISSION IS TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 511 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: +14V B REGULATOR FAILS HIGH/LOW

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, CONTAMINATION, SHORT

EFFECTS/RATIONALE:
LOSS OF ONE TRANSMITTER/RECEIVER SET. IF REDUNDANT SETS FAIL,
MISSION IS TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 512 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: MODE A/BACKUP TRANSMITTER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: INTERNAL TRANSMITTER, ELECTRONICS FAIL OPEN, ELECTRICAL
SHORT, RELAY TO ANTENNA FAILS OPEN

EFFECTS/RATIONALE:
IF REDUNDANT TRANSMITTER WERE TO ALSO FAIL, MISSION WOULD BE
TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 513 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: MODE B/TRANSMITTER, LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: INTERNAL TRANSMITTER, ELECTRONICS FAIL OPEN, ELECTRICAL
SHORT, RELAY TO ANTENNA FAILS OPEN

EFFECTS/RATIONALE:
IF REDUNDANT TRANSMITTER WERE TO ALSO FAIL, MISSION WOULD BE
TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 514 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: 296.8 MHZ RECEIVER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONIC OPEN, ELECTRICAL SHORT, LOSS OF POWER

EFFECTS/RATIONALE:

IF REDUNDANT RECEIVERS WERE ALSO LOST, MISSION WOULD BE
TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 515 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: 259.7 MHZ RECEIVER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/2R
EVA: 3/2R
POST-EVA: 3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRICAL SHORT, MUTE LATCH FAILS
CLOSED FOR TRANSMITTER, LOSS OF POWER

EFFECTS/RATIONALE:
IF REDUNDANT RECEIVERS WERE ALSO LOST, MISSION WOULD BE
TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 516 FLIGHT: 3/2R

ITEM: EVC
FAILURE MODE: 279.0 MHZ RECEIVER LOSS OF SIGNAL

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRICAL SHORT, LOSS OF POWER

EFFECTS/RATIONALE:
IF REDUNDANT RECEIVERS WERE ALSO LOST, MISSION WOULD BE
TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 517 FLIGHT: 3/2R

ITEM: ANTENNA
FAILURE MODE: LOSS OF SIGNAL (ANY ONE OF THREE)

LEAD ANALYST: G. RAFFAELLI SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) LSS
- 3) EVCS
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER:

CAUSES: ELECTRICAL OPEN

EFFECTS/RATIONALE:

NO IMPACT FOR SINGLE FAILURE. LOSS OF OTHER REDUNDANT TRANSMIT
OR RECIEVE FUNCTIONS WILL RESULT IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: EMU
MDAC ID: 600

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: NECK RING AND VENT SEAL ASSEMBLY
FAILURE MODE: JAM OF LOCK MECHANISM (CAN NOT MATE TO HELMET FROM
NECK RING 1)

LEAD ANALYST: J. WHITMAN

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:

PART NUMBER: A/L 9357-10/9713-03

CAUSES: BROKEN/LOOSENDED SPRING IN LOCK. MECHANISM, MATERIAL
CAUGHT IN MECHANISM) MISALIGNED LOCKING PINS.

EFFECTS/RATIONALE:

IF CANNOT MATE EVA, MISSION IS TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 601 FLIGHT: 2/2

ITEM: NECK RING AND VENT SEAL ASSEMBLY
FAILURE MODE: JAM OF LOCK MECHANISM (CAN NOT DEMATE HELMET FROM
NECK RING)

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	/
POST-EVA:	2/2

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:

PART NUMBER: A/L 9357-10/9713-03

CAUSES: FAULTY SPRING IN LOCK MECHANISM, MATERIAL CAUGHT IN
MECHANISM, MISALIGNED LOCKING PINS.

EFFECTS/RATIONALE:

DEMATE CAN BE FORCED OR SUIT DOFFED WITHOUT HELMET REMOVAL,
SUBSEQUENT MISSIONS PROBABLY TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: _____
SUBSYSTEM: EMU
MDAC ID: 602

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: NECK RING AND VENT SEAL ASSEMBLY
FAILURE MODE: LEAKAGE OF NECK RING.

LEAD ANALYST: J. WHITMAN

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: A/L 9357-10/9713-03

CAUSES: FAULTY OR ERODED LIP SEALS OR GASKETS, MISINSTALLED OR MISSING SCREWS

EFFECTS/RATIONALE:

IF LEAKAGE OUT OF MAKE UP TOLERANCE MISSION WOULD BE TERMINATED.
IF LEAK LARGE ENOUGH WITH A CONCURRENT SOP FAILURE, CREWPERSON POSSIBLY LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 603 FLIGHT: 1/1

ITEM: NECK RING AND VENT SEAL ASSEMBLY
FAILURE MODE: NECK RING FAILURE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	1/1
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9357-10/9713-03

CAUSES: BROKEN/LOOSEMED SPRING, BROKEN LOCKING PINS.

EFFECTS/RATIONALE:
IF THIS FAILURE WERE TO OCCUR EVA IT WOULD RESULT IN LOSS OF
CREWPERSON DUE TO PROBABLE LARGE LEAK EXCEEDING SOP MAKEUP
CAPABILITY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 604 FLIGHT: 2/1R

ITEM: WATER LINE AND VENT TUBE ASSMEBLY
FAILURE MODE: WATER FLOWN BLOCKAGE.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: 0102-82437-18

CAUSES: MATERIAL IN LINES, CONTAMINATION

EFFECTS/RATIONALE:
BLOCKAGE COULD CAUSE MISSION TERMINATION DUE TO DEGRADATION OF
COOLING FOR CREWPERSON. POSSIBLE SOP USEAGE REQUIRED. POSSIBLE
LOSS OF CREWPERSON WITH LOSS OF SOP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 605 FLIGHT: 2/1R

ITEM: WATER LINE AND VENT TUBE ASSMEBLY
FAILURE MODE: WATER LINE LEAKAGE.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: 0102-82437-18

CAUSES: FAULTY TUBING OR SEALS.

EFFECTS/RATIONALE:

LOSS OF FEEDWATER CAPACITY RESULTS IN LOSS OF COOLING. PROBABLE SOP USEAGE REQUIRED. ADDITIONALLY, WATER IN THE SUIT COULD RESULT IN BLOCKAGE OF THE PURGE VALVBES BY ICE FORMATION THEREBY INHIBITING SOP OPERATION. IF SOP WERE REQUIRED AND THE VALVES WERE BLOCKED, POSSIBLE LOSS OF CREWPERSON WOULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 606 FLIGHT: 2/1R

ITEM: WATER LINE AND VENT TUBE ASSMEBLY
FAILURE MODE: 02 LEAKAGE DIRECTLY TO HUT.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/1R
POST-EVA:	3/3

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:
PART NUMBER: 0102-82437-18

CAUSES: DEFECTIVE O RINGS, ERODED TUBING, IMPROPER BONDING AT
FLANGE MOUNT.

EFFECTS/RATIONALE:
POSSIBLE DEGRADATION OF ORAL-NASAL FLUSH CAN RESULT IN HIGH LEVEL
OF HUMIDITY AND CO2 IN CREWPERSONS ORAL NASAL AREA. IF CREWPERSON
DOES NOT DETECT CO2 BUILDUP (THEY ARE TAUGHT THE SYMPTONS),
POSSIBLE CREWPERSON LOSS CAN RESULT.
(NO ALTERNATE/REDUNDANT PATH EXISTS).

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 607 FLIGHT: 3/3

ITEM: MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: LEAKAGE WHEN UNMATED TO LCVG HALF OF CONNECTOR.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9694-08

CAUSES: O-RINGS OR POPPETS DEFECTIVE, MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:
LEAKAGE OF WATER INTO AIRLOCK. REQUIRES USAGE OF MORE WATER FOR RECHARGE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 608 FLIGHT: 2/2

ITEM: MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: JAM. FAIL TO MATE WITH LCVG HALF OF CONNECTOR.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9694-08

CAUSES: BROKEN/LOOSEMED RING LATCH IN LOCK POSITION, MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:
MISSION TERMINATION DUE TO INABILITY TO MATE LCVG TO HUT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 609 FLIGHT: 2/2

ITEM: MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: JAM. FAIL TO DEMATE WITH LCVG HALF OF CONNECTOR.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9694-08

CAUSES: MATERIAL IN COUPLING MECHANISM

EFFECTS/RATIONALE:

WOULD HAVE TO BE FORCED OPEN. POSSIBLE TERMINATION OF SUBSEQUENT MISSIONS IF DAMAGE OCCURS DURING OPENING.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 610 FLIGHT: 2/1R

ITEM: MULTIPLE WATER CONNECTOR (HUT HALF)
FAILURE MODE: LEAKAGE-MATED.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: A/L 9694-08

CAUSES: CUT O-RINGS, DEFECTIVE SURFACE FOR SEALING OF SPRING.

EFFECTS/RATIONALE:

IF DISCOVERED PRE OR POST EVA, WOULD TERMINATE UPCOMING AND SUBSEQUENT MISSIONS. IF EVA, GRADUAL H2O LOSS CAN CAUSE WATER TO MIGRATE TO AND FAIL THE VENT LOOP. SOP USEAGE WOULD THEN BE REQUIRED; HOWEVER THE PURGE VALVES COULD BE BLOCKED BY ICE DUE TO THE FREE WATER. IF THIS OCCURS, POSSIBLE LOSS OF CREWPERSON COULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 611 FLIGHT: 2/1R

ITEM: HARD UPPER TORSO SHELL
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: SV772375-21

CAUSES: DEFECTIVE MATERIALS, DAMAGE

EFFECTS/RATIONALE:

LOSS OF PRIMARY PRESSURE MAINTENANCE VIA THE PLSS COULD RESULT IN
SOP USEAGE. IF THE SOP FAILS, CREWPERSON COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 612 FLIGHT: 2/2

ITEM: HARD UPPER TORSO SHELL
FAILURE MODE: UNABLE TO MATE EEH. TO CCA

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: SV772375-21

CAUSES: IMPROPER BONDING, BAD MATERIALS.

EFFECTS/RATIONALE:

TERMINATE MISSION IF UNABLE TO MATE TO CCA DUE TO LOSS OF
COMMUNICATIONS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 613 FLIGHT: 1/1

ITEM: GIMBAL ASSY.
FAILURE MODE: DISATTACHMENT OF PIVOTS.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	1/1
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: SV772302-1/SV772308-5

CAUSES: DEFECTIVE MATERIAL, DAMAGING IMPACTS.

EFFECTS/RATIONALE:

IF DISSATTACHMENT OCCURS EVA, ARMS COULD SEPARATE FROM HUT AND
RAPID SOP DEPLETION WOULD OCCUR WITH LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 614 FLIGHT: 2/1R

ITEM: BELLOWS ASSEMBLY
FAILURE MODE: LEAKAGE.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: 0102-82438-16

CAUSES: DEFECTIVE ATTACHMENT, IMPACT DAMAGE.

EFFECTS/RATIONALE:
LOSS OF PRESSURE INTEGRITY. LEAKAGE OF PRIMARY O2 SUPPLY. IF
LEAKAGE EXCEEDS SOP MAKEUP OR SIMULTANEOUS SOP FAILURE OCCURS,
POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 615 FLIGHT: 2/1R

ITEM: BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE: LEAKAGE.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: A/L 9786-05

CAUSES: DAMAGE, DETERIORATING O-RING, MATERIAL CAUGHT IN
INTERFACE, DAMAGE DUE TO IMPACT.

EFFECTS/RATIONALE:
LOSS OF PRESSURE INTEGRITY. LEAKAGE OF PRIMARY O2 SUPPLY. IF
LEAKAGE EXCEEDS SOP MAKEUP OR SIMULTANEOUS SOP FAILURE OCCURS,
CREWMEMBER COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 616 FLIGHT: 2/2

ITEM: BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE: FAILURE TO MATE.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: A/L 9786-05

CAUSES: MATERIAL IN MECHANISM, MISALIGNED LOCKING PINS,
BROKEN/LOOSEENED SPRING.

EFFECTS/RATIONALE:

INABILITY TO MATE HUT TO LTA RESULTS IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 617 FLIGHT: 2/2

ITEM: BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE: FAILURE TO DEMATE.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4) BODY SEAL CLOSURE (HUT SIDE)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9786-05

CAUSES: MATERIAL IN MECHANISM, UNEVEN LOADS ON HALFS OF
MECHANISM, BROKEN/LOOSEENED SPRING DEVICE.

EFFECTS/RATIONALE:
WOULD HAVE TO BE FORCED OPEN RESULTING IN PROBABLE DAMAGE TO
MECHANISM. TERMINATION OF SUBSEQUENT MISSIONS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 618 FLIGHT: 1/1

ITEM: BODY SEAL CLOSURE (HUT SIDE)
FAILURE MODE: LOCK MECHANISM FAILURE-OPEN

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	1/1
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: A/L 9786-05

CAUSES: DAMAGE OR DEFECTIVE LOCKING MECHANISM.

EFFECTS/RATIONALE:
IF FAILURE OCCURRED EVA RESULTING LEAKAGE WOULD DEplete PRIMARY
O2 SUPPLY AND WOULD LIKELY EXCEED SOP CAPABILITY TO MAKEUP LOST
OXYGEN. PROBABLE LOSS OF CREWPERSON. MISSION TERMINATION IF PRE
OR POST EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 619 FLIGHT: 3/3

ITEM: HARNESS STRAP AND HARNESS PAD ASSMEBLY
FAILURE MODE: DISLOCATION OF STRAP AND/OR PAD ASSEMBLY

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HUT
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0102-82718-09/10;0102-82717-01/02

CAUSES: MATERIALS OR ATTACHMENT FAILURE.

EFFECTS/RATIONALE:
THIS DEVICE IS MAINLY FOR 1-G EXERCISES AND WETF. OFTEN NOT USED
IN ACTUAL FLIGHT. NO IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 620 FLIGHT: 3/2R

ITEM: COMBINATION PURGE VALVE
FAILURE MODE: FAIL CLOSED.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HELMET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: A/L 9819-07

CAUSES: MECHANISM DAMAGED, BAD O-RINGS, SCREW DAMAGED OR SEATED IMPROPERLY, OUTSIDE MATERIAL IN MECHANISM, CORROSION.

EFFECTS/RATIONALE:

IF SIMULTANEOUS CPV AND DCM PURGE VALVE FAILURES OCCUR MISSION SHOULD BE TERMINATED DUE TO LOSS OF PURGE CAPABILITY EMPLOYING THE SOP.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 621 FLIGHT: 2/1R

ITEM: COMBINATION PURGE VALVE
FAILURE MODE: FAIL OPEN/INTERNAL LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HELMET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/1R
POST-EVA: 2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: A/L 9819-07

CAUSES: MECHANISM DAMAGED, BAD O-RINGS, SCREW DAMAGED OR SEATED
IMPROPERLY, OUTSIDE MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:
IF CPV WERE TO FAIL OPEN EVA IT WOULD RESULT IN MISSION
TERMINATION AND DEPLETION OF PRIMARY O2 SYSTEM REQUIRING SOP
USAGE. IF SOP IS FAILED, POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE:
SUBSYSTEM: EMU
MDAC ID: 622

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/1R

ITEM: HELMET ASSEMBLY
FAILURE MODE: LEAKAGE.

LEAD ANALYST: J. WHITMAN

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HELMET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: A/L 9672-01

CAUSES: IMPACT TO HELMET, IMPROPER SEATING OF HELMET TO NECK RING.

EFFECTS/RATIONALE:

IF LEAKAGE EXCEEDS PRIMARY O2 SYSTEM AND SOP MAKEUP OR HAVE SIMULTANEOUS SOP FAILURE WITH DEPLETION OF PRIMARY SYSTEM, COULD ENDANGER CREWMEMBERS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 623 FLIGHT: 2/2

ITEM: EXTRAVEHICULAR VISOR ASSEMBLY
FAILURE MODE: JAM OF SUN VISOR (SUN VISORS) IN OPEN POSITION

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HELMET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9813-12

CAUSES: WARPED EVVA SHELL, IMPACT DAMAGE, MATERIAL TRAPPED IN MECHANISM.

EFFECTS/RATIONALE:
POSSIBLE MISSION TERMINATION DUE TO INABILITY OF CREWPERSON TO SEE IN BRIGHT SUN.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 624 FLIGHT: 3/3

ITEM: EXTRAVEHICULAR VISOR ASSEMBLY
FAILURE MODE: JAM OF SUN VISOR (SUN VISORS) IN CLOSED POSITION

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HELMET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9813-12

CAUSES: WARPED EVVA SHELL, IMPACT DAMAGE, MATERIAL TRAPPED IN MECHANISM.

EFFECTS/RATIONALE:
NO IMPACTS TO MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 625 FLIGHT: 2/2

ITEM: EXTRAVEHICULAR VISOR ASSEMBLY
FAILURE MODE: CRACK IN SUN VISOR (SUN VISORS)

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HELMET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9813-12

CAUSES: IMPACT DAMAGE.

EFFECTS/RATIONALE:
POSSIBLE MISSION TERMINATION DUE TO IMPAIRED ABILITY OF
CREWPERSON TO SEE IN BRIGHT SUN.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 626 FLIGHT: 2/2

ITEM: EXTRAVEHICULAR VISOR ASSEMBLY
FAILURE MODE: CRAZING (SCRATCHING) IN GOLD SUN VISOR

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) HELMET
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9813-12

CAUSES: IMPACT DAMAGE.

EFFECTS/RATIONALE:
IMPAIRED MISSION DURING EVA AND POSSIBLE INCREASE OF UV LIGHT
THROUGH VISOR WOULD RESULT IN MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 627 FLIGHT: 2/1R

ITEM: UPPER/LOWER ARM RESTRAINT AND BLADDER ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: 0103-82318-22 0103-82351-16

CAUSES: PUNCTURE HOLE, DEFECTIVE MATERIAL, LOOSE/IMPROPERLY
INSTALLED SCREWS AT FLANGE MOUNTS, MATERIAL TRAPPED IN FLANGE
MOUNT.

EFFECTS/RATIONALE:

DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE IS IN EXCESS OF
SECONDARY OXYGEN SUPPLY OR IF SECONDARY OXYGEN SUPPLY IS LOST
LEAKAGE WOULD RESULT IN LOSS OF CREWMEMBER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 628 FLIGHT: 2/1R

ITEM: UPPER/LOWER ARM RESTRAINT AND BLADDER ASSEMBLY
FAILURE MODE: LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: 0103-82318-22 0103-82351-16

CAUSES: DEFECTIVE MATERIAL, TORN OR RIPPED RESTRAINT. LOOSE SET
SCREW ALLOWING RESTRAINT TO UNSEAT BEFORE PRESSURIZATION

EFFECTS/RATIONALE:

IF SECONDARY RESTRAINT AND SOP ALSO LOST, COULD RESULT IN LOSS OF
PRESSURE CONTAINMENT/MAKEUP AND CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 629 FLIGHT: 2/1R

ITEM: SCYE BEARING ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: A/L 9782-04.

CAUSES: SEPARATOR SEAL NOT FUNCTIONING PROPERLY, DAMAGED O-RINGS, FOREIGN MATTER IN MECHANISM.

EFFECTS/RATIONALE:
PROBABLE DEPLETION OF PRIMARY OXYGEN. IF LEAKAGE IS OUTSIDE SOP MAKEUP CAPABILITY OR SOP IS LOST, THEN CREWMEMBER MAY BE LOST IF EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 630 FLIGHT: 2/2

ITEM: SCYE BEARING ASSEMBLY
FAILURE MODE: BEARING TORQUES HIGH

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: A/L 9782-04

CAUSES: ENVIRONMENTAL SEAL OUT OF TRACK. OVER LUBRICATION,
FOREIGN MATTER IN THE MECHANISM.

EFFECTS/RATIONALE:

BEARING JAMS DUE TO HIGH TORQUE, SHOULDERS UNABLE TO ROTATE.
CANCEL OR TERMINATE MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 631 FLIGHT: 2/1R

ITEM: ARM BEARING ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: A/L 9657-06

CAUSES: SEPARATOR SEAL NOT FUNCTIONING PROPERLY. DAMAGED O-RINGS, FOREIGN MATTER IN MECHANISM.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY O2. IF LEAKAGE EXCEEDS SOP MAKEUP OR SOP FAILS, THEN CREWMEMBER MAYBE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 632 FLIGHT: 2/2

ITEM: ARM BEARING ASSEMBLY
FAILURE MODE: BEARING TORQUES HIGH

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:

PART NUMBER: A/L 9657-06

CAUSES: ENVIRONMENTAL SEAL OUT OF TRACK. OVER LUBRICATION
FOREIGN MATTER IN THE MECHANISM.

EFFECTS/RATIONALE:

BEARING JAMS DUE TO HIGH TORQUE. ARMS UNABLE TO ROTATE. CANCEL OR
TERMINATE MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 633 FLIGHT: 2/2

ITEM: WRIST DISCONNECT
FAILURE MODE: LOCK/JAM OPEN

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:

PART NUMBER: A/L 9813-02 A/L 9814-02

CAUSES: FOREIGN MATERIAL IN MECHANISM. DEFECTIVE OR DAMAGED MECHANISM.

EFFECTS/RATIONALE:

A JAM IN OPEN POSITION WOULD CANCEL EVA MISSION DUE TO INABILITY TO DON SUIT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 634 FLIGHT: 2/2

ITEM: WRIST DISCONNECT
FAILURE MODE: LOCK JAM CLOSED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	/
POST-EVA:	2/2

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:
PART NUMBER: A/L 9813-02 A/L 9814-02

CAUSES: FOREIGN MATERIAL IN MECHANISM. DEFECTIVE OR DAMAGED MECHANISM.

EFFECTS/RATIONALE:
A JAM IN CLOSED POSITION WOULD CANCEL SUBSEQUENT EVA MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 635 FLIGHT: 2/1R

ITEM: WRIST DISCONNECT
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: A/L 9813-02 A/L 9814-02

CAUSES: SCREWS IMPROPERLY SEATED. DEFECTIVE O-RINGS. FOREIGN MATERIAL IN MECHANISM.

EFFECTS/RATIONALE:

DEPLETION OF PRIMARY O2 SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR SOP FAILS DURING EVA, POSSIBLE LOSS OF CREWPERSON CAN RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 636 FLIGHT: 1/1

ITEM: WRIST DISCONNECT
FAILURE MODE: LOCK FAILURE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) ARM ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	1/1
POST-EVA:	2/2

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:
PART NUMBER: A/L 9813-02 A/L 9814-02

CAUSES: FOREIGN MATERIAL IN MECHANISM. DEFECTIVE OR DAMAGED
LOCKING MECHANISM. MATERIAL FATIGUE.

EFFECTS/RATIONALE:
IF FAILURE WERE TO OCCUR DURING EVA GROSS LOSS OF OXYGEN AND
PRESSURE RESULTS. LOSS OF CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 637 FLIGHT: 2/2

ITEM: RESTRAINT MODIFIED
FAILURE MODE: RESTRAINT LAYER AND BLADDER SEPARATION

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:
PART NUMBER: 0106-85894-11/12

CAUSES: DEFECTIVE ADHESION AT FINGER CAPS AND OR ATTACH POINTS.

EFFECTS/RATIONALE:
MISSION WOULD BE TERMINATED DUE TO TOTAL LOSS OF GLOVE FUNCTION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 638 FLIGHT: 2/2

ITEM: RESTRAINT MODIFIED
FAILURE MODE: SIZING LINES IN FINGERS FAILED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:
PART NUMBER: 0106-85894-11/12

CAUSES: D

EFFECTS/RATIONALE:
SIZING OF GLOVES WOULD BE LOST AND LOSS OF CREWMEMBER DEXTERITY
WOULD TERMINATE OR IMPACT THE MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 639 FLIGHT: 2/2

ITEM: RESTRAINT MODIFIED
FAILURE MODE: PALM BAR SEPARATED FROM POSITION.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 2/2
EVA: 2/2
POST-EVA: 2/2

REDUNDANCY SCREENS: A [NA] B [NA] C [NA]

LOCATION:
PART NUMBER: 0106-85894-11/12

CAUSES: RESTRAINT LOOP MATERIAL DAMAGED OR DEFECTIVE.

EFFECTS/RATIONALE:
COULD CAUSE LOSS OF GLOVE DEXTERITY AND CREWMEMBER DISCOMFORT,
MISSION TERMINATION RESULTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 640 FLIGHT: 2/1R

ITEM: RESTRAINT MODIFIED
FAILURE MODE: PRIMARY AXIAL RESTRAINT SEPARATED.

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: 0106-85894-11/12

CAUSES: DEFECTIVE, DAMAGED MATERIAL. SET SCREW IMPROPERLY SEATED.

EFFECTS/RATIONALE:
SECONDARY AXIAL RESTRAINT WILL TAKE LOAD IF PRIMARY FAILS. IF SECONDARY AXIAL RESTRAINTS FAIL, CREWMEMBER MAY BE LOST. MISSION IS TERMINATED IF FAILURE DETECTED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 641 FLIGHT: 2/1R

ITEM: BLADDER ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:
PART NUMBER: 0106-87543-01/02

CAUSES: PUNCTURE, WEAR ON BLADDER AT FLANGE.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE OCCURS DURING EVA
AND EXCEEDS THE SOP CAPACITY OR IF THE SOP FAILS, LOSS OF
CREWMEMBER COULD RESULT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: _____ HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 642 FLIGHT: 2/1R

ITEM: WRIST DISCONNECT (GLOVE SIDE)
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: AL 9924-01

CAUSES: IMPROPERLY SEATED OR DAMAGED SEALS, IMPROPERLY SEATED
SCREWS. DEFECTIVE O-RINGS. FOREIGN MATTER IN MECHANISM.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP
CAPACITY OR SOP FAILS DURING EVA, LOSS OF CREWMEMBER IS POSSIBLE.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 643 FLIGHT: 2/2

ITEM: WRIST DISCONNECT (GLOVE SIDE)
FAILURE MODE: BEARING TORQUE HIGH

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: AL 9924-01

CAUSES: SEALS TORN. LUBRICATION OUT OF SPEC. BEARING OUT OF ROUND.

EFFECTS/RATIONALE:
BEARING COULD JAM. LIMITING WRIST MOVEMENT. MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 644 FLIGHT: 2/2

ITEM: PALM RESTRAINT
FAILURE MODE: PALM BAR RESTRAINT SLIPPED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0106-23421-03/86059-01

CAUSES: MATERIAL FATIGUED

EFFECTS/RATIONALE:
IF PALM FIT IS COMPROMISED, EVA MISSION WOULD BE TERMINATED OR
ADVERSELY AFFECTED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 645 FLIGHT: 2/2

ITEM: PALM RESTRAINT
FAILURE MODE: PALM BAR BENT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) GLOVE ASSEMBLY
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0106-23421-03/86059-01

CAUSES: MATERIAL FATIGUED

EFFECTS/RATIONALE:
PALM BAR COULD PINCH CREWMEMBER'S HAND RESULTING IN MISSION
TERMINATION OR IMPACT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 646 FLIGHT: 2/1R

ITEM: WAIST RESTRAINT AND BLADDER
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: 0104-82347-107 0104-84811-05

CAUSES: STITCH SEPARATION, PUNCTURE, FOREIGN MATERIAL TRAPPED AT FLANGE, LOOSE OR MISSEATED SCREWS AT FLANGE.

EFFECTS/RATIONALE:

DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP OR IF SOP FAILS DURING EVA, THIS COULD CAUSE LOSS OF CREWMEMBER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 647 FLIGHT: 2/1R

ITEM: WAIST RESTRAINT AND BLADDER
FAILURE MODE: LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: 0104-82347-107 0104-84811-05

CAUSES: DEFECTIVE MATERIAL OR MANUFACTURE.

EFFECTS/RATIONALE:

SECONDARY AXIAL RESTRAINT IS THE REDUNDANT ITEM. FAILURE OF BOTH OF THESE COULD RESULT IN LOSS OF CREWMEMBER DUE TO LOSS OF STRUCTURAL INTEGRITY OF LTA (WAIST).

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 648 FLIGHT: 2/1R

ITEM: WAIST BEARING
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: A/L 9698-08

CAUSES: MISSEATED SEAL, MISSEATED OR MISSING SCREWS, BAD O-RINGS, MISMATCH OF PRESSURE SEAL AND BEARING RACE WIDTHS.

EFFECTS/RATIONALE: DEPLETION OF PRIMARY OXYGEN IF LEAKAGE EXCEEDS SOP MAKEUP OR SOP FAILS DURING EVA, POSSIBLE LOSS OF CREWMEMBER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 649 FLIGHT: 2/2

ITEM: WAIST BEARING
FAILURE MODE: BEARING TORQUES HIGH

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9698-08

CAUSES: FOREIGN MATERIAL IN MECHANISM, MISEATED SEALS, OR UNDER-LUBRICATION.

EFFECTS/RATIONALE:
BEARING TORQUES HIGH OR BEARING JAMMING RESULTS IN MISSION
TERMINATION DUE TO DEGRADATION OF MOBILITY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 650 FLIGHT: 2/1R

ITEM: LOWER TORSO RESTRAINT/BLADDER ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: 0104-82335-22

CAUSES: PUNCTURE OF BLADDER. SEAM SEPARATION OF BLADDER

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE RATE EXCEEDS SOP
MAKEUP OR IF SOP FAILS DURING EVA, THIS COULD RESULT IN LOSS OF
CREWMEMBER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 651 FLIGHT: 2/1R

ITEM: LOWER TORSO RESTRAINT/BLADDER ASSEMBLY
FAILURE MODE: LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:
PART NUMBER: 0104-82335-22

CAUSES: DEFECTIVE MATERIAL KEEPER SCREW MISSING FROM RESTRAINT
BRACKET.

EFFECTS/RATIONALE:
SECONDARY AXIAL RESTRAINTS PROVIDE REDUNDANCY. FAILURE OF BOTH
COULD RESULT IN LOSS OF CREWMEMBER DUE TO LOSS OF LTA STRUCTURAL
INTEGRITY.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: _____ HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 652 FLIGHT: 2/1R

ITEM: BOOT DISCONNECT
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: A/L 9752-01

CAUSES: DEFECTIVE O-RING MISSEATED SCREWS

EFFECTS/RATIONALE:

DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP
OR SOP FAILS DURING EVA, CREWMEMBER COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 653 FLIGHT: 2/1R

ITEM: PRESSURE BOOT ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: 0104-82403-29/30

CAUSES: PUNCTURE. DEFECTIVE MATERIAL.

EFFECTS/RATIONALE:

DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP
OR IF SOP FAILS DURING EVA, CREWMEMBERS COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 654 FLIGHT: 2/1R

ITEM: PRESSURE BOOT ASSEMBLY
FAILURE MODE: LOSS OF PRIMARY AXIAL RESTRAINT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: 0104-82403-29/30

CAUSES: LOOSE SCREW AT KEEPER BRACKET, MATERIAL FATIGUED/WORN.

EFFECTS/RATIONALE:
SECONDARY AXIAL RESTRAINT IS REDUNDANT. LOSS OF BOTH RESTRAINTS
COULD RESULT IN LOSS OF SUIT PRESSURE INTEGRITY AND CREWPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 655 FLIGHT: 3/3

ITEM: BOOT SIZING INSERT
FAILURE MODE: BOOTS INSERTS OUT OF PLACE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0104-82664-17/18

CAUSES: DEFECTIVE VELCRO

EFFECTS/RATIONALE:
INSERTS ARE NOT MISSION OR LIFE/VEHICLE CRITICAL. NO IMPACTS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 656 FLIGHT: 2/2

ITEM: BODY SEAL CLOSURE (LTA SIDE)
FAILURE MODE: JAMMED OPEN

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: A/L 9787-05

CAUSES: FOREIGN MATTER IN MECHANISM

EFFECTS/RATIONALE:

IF JAMMED OPEN MISSION WOULD BE CANCELLED OR SUBSEQUENT MISSIONS
TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 657 FLIGHT: 2/2

ITEM: BODY SEAL CLOSURE (LTA SIDE)
FAILURE MODE: JAMMED CLOSED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: A/L 9787-05

CAUSES: FOREIGN MATTER IN MECHANISM

EFFECTS/RATIONALE:

IF JAMMED CLOSED IT WOULD HAVE TO BE PRIED OPEN (PRYBAR AVAILABLE), THIS WOULD DAMAGE THE MECHANISM OF THE LOCK AND THUS CANCEL ANY UPCOMING EVAS.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 658 FLIGHT: 2/1R

ITEM: BODY SEAL CLOSURE (LTA SIDE)
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:
PART NUMBER: A/L 9787-05

CAUSES: IMPROPER LIP SEAL DAMAGED O-RINGS.

EFFECTS/RATIONALE:
DEPLETION OF PRIMARY OXYGEN SUPPLY. IF LEAKAGE EXCEEDS SOP MAKEUP CAPABILITY OR IF SOP FAILS DURING EVA, CREWMEMBERS COULD BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 659 FLIGHT: 2/1R

ITEM: BODY SEAL CLOSURE (LTA SIDE)
FAILURE MODE: LOCK MECHANISM FAILURE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: A/L 9787-05

CAUSES: LOCK SPRING BROKEN OR RELAXED.

EFFECTS/RATIONALE:

THIS IS A TWO LOCK MECHANISM WHERE IF EITHER OR BOTH FAIL THE MISSION SHOULD BE TERMINATED. IF BOTH LOCKS FAIL EVA, CREWMEMBER COULD BE LOST DUE TO SEPARATION OF HUT FROM LTA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 660 FLIGHT: 3/3

ITEM: RESTRAINT ASSEMBLY
FAILURE MODE: ZIPPER JAMMED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0107-82968-07

CAUSES: TRAPPED MATERIAL, DEFECTIVE ZIPPER

EFFECTS/RATIONALE:
NO IMPACT ON MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 661 FLIGHT: 3/3

ITEM: RESTRAINT ASSEMBLY
FAILURE MODE: MATERIAL TORN

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: 0107-82968-07

CAUSES: MATERIAL PUNCTURED DUE TO CONTACT WITH HEAD OBJECT (SUCH AS A CONNECTOR).

EFFECTS/RATIONALE:
NO EFFECT ON EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 662 FLIGHT: 2/1R

ITEM: RESTRAINT ASSEMBLY
FAILURE MODE: PUNCTURED OR LEAKING WATER TUBING

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: 0107-82968-07

CAUSES: FAULTY MATERIAL, DEFECTIVE BOND

EFFECTS/RATIONALE:

LOSS OF WATER. MISSION TERMINATED. VENT LOOP FLOODING WILL REQUIRE SOP USEAGE. IF PURGE VALVE (USED WITH SOP) IS BLOCKED BY WATER FREEZING IN IT, CREWPERSON CAN BE LOST.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 663 FLIGHT: 3/3

ITEM: LINER ASSEMBLY
FAILURE MODE: LINER TORN OR HAS HOLE IN IT

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LTA
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: 0107-82973-02

CAUSES: TEAR, PUNCTURE, DEFECTIVE MATERIAL

EFFECTS/RATIONALE:

THIS IS A COMFORT DEVICE NOT REQUIRED FOR MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 664 FLIGHT: 2/1R

ITEM: VENT MANIFOLD AND DUCTS
FAILURE MODE: IMPAIRMENT OF FLOW THROUGH DUCTS AND MANIFOLD

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [F] C [P]

LOCATION:

PART NUMBER: 0107-811060-08/82568-09/81057-19/20

CAUSES: HOLE, TEAR, COLLAPSE, OR BLOCKAGE BY FOREIGN MATERIAL OF
DUCT OR MANIFOLD

EFFECTS/RATIONALE:

IMPAIRED VENT FLOW WOULD REDUCE COOLING, CO2 REMOVAL, AND
HUMIDITY CONTROL. MISSION TERMINATION. POSSIBLE SOP USAGE
REQUIRED. CREWPERSON LOSS IS POSSIBLE IF SOP ALSO FAILED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 665 FLIGHT: 2/1R

ITEM: VENT MANIFOLD AND DUCTS
FAILURE MODE: COMPLETE BLOCKAGE OF FLOW THROUGH DUCTS AND
MANIFOLDS

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: 0107-811060-08/82568-09/81057-19/20

CAUSES: BLOCKAGE OF DUCTS OR MANIFOLD BY FOREIGN MATERIAL

EFFECTS/RATIONALE:

THIS WOULD GREATLY IMPAIR COOLING CO2 CONTROL, AND OXYGEN
DELIVERY TO CREWPERSON. THE SOP IS THE REDUNDANT SYSTEM. LOSS
OF SOP WOULD ENDANGER THE CREW MEMBER.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 666 FLIGHT: 2/2

ITEM: MULTIUPLE CONNECTOR (LCVG HALF)
FAILURE MODE: WILL NOT MATE WITH HUT HALF

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	/NA
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: A/L 9693-03/9697-04

CAUSES: ALIGNMENT PIN BROKEN

EFFECTS/RATIONALE:

IF HALVES CANNOT BE MATED, MISSION WOULD BE TERMINATED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 667 FLIGHT: 3/3

ITEM: MULTIUPLE CONNECTOR (LCVG HALF)
FAILURE MODE: LEAKAGE WHEN DEMATED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: A/L 9693-03/9697-04

CAUSES: SPRING BROKEN OR LOOSENED, DEFECTIVE O-RING

EFFECTS/RATIONALE:

LEAKAGE WHEN NOT MATED WILL NOT IMPACT EVA MISSION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 9/23/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 668 FLIGHT: 2/1R

ITEM: MULTIUPLE CONNECTOR (LCVG HALF)
FAILURE MODE: LEAKAGE WHEN MATED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) LCVG
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/1R
POST-EVA:	2/2

REDUNDANCY SCREENS: A [2] B [P] C [F]

LOCATION:

PART NUMBER: A/L 9693-03/9697-04

CAUSES: BAD O-RINGS, MISSING HOSE CLAMP SCREWS

EFFECTS/RATIONALE:

GRADUAL LOSS/DEGRADATION OF COOLING DUE TO LOSS OF WATER SUPPLY INTO THE EMU. THE WATER WOULD EVENTUALLY MIGRATE INTO AND FAIL THE VENT LOOP THEREBY REQUIRING SOP USEAGE. BECAUSE THE SOP REQUIRES A PURGE VALVE BE OPENED TO BE ACTIVATED, THIS TOO COULD BE FAILED BY WATER FREEZING IN THE PURGE VALVE AND BLOCKING IT. POSSIBLE LOSS OF CREWSPERSON.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 669 FLIGHT: 2/2

ITEM: BITE VALVE ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) IDB
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/2
POST-EVA:	3/3

REDUNDANCY SCREENS: A [2] B [P] C [P]

LOCATION:

PART NUMBER: 0110-24777-05

CAUSES: SEAL THREADS BROKEN DEFECTIVE Q-RING BROKEN SPRING
PUNCTURE IN DIAPHRAM FOREIGN MATTER IN VALVE

EFFECTS/RATIONALE:

IDB NOT MANDATORY TO PERFORM EVA, HOWEVER, IF EVA, LEAKAGE WOULD
CAUSE CREWPERSON DISCOMFORT AND COULD RESULT IN MISSION
TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 670 FLIGHT: 3/3

ITEM: BITE VALVE ASSEMBLY
FAILURE MODE: CANNOT GET WATER FROM VALVE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) IDB
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	3/3
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0110-24777-05

CAUSES: FOREIGN MATTER IN VALVE. BROKEN OR LOOSE MOUTH PIECE

EFFECTS/RATIONALE:
IDB NOT MANDATORY TO PERFORM EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 671 FLIGHT: 2/2

ITEM: BLADDER ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) IDB
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/2
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0110-82829-10

CAUSES: PUNCTURE, HEAT SEAL FAILURE AT SEAM

EFFECTS/RATIONALE:
IDB NOT MANDATORY FOR EVA. LEAKAGE WOULD CAUSE CREWMAN
DISCOMFORT. POSSIBLE MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 672 FLIGHT: 2/2

ITEM: BLADDER ASSEMBLY
FAILURE MODE: BAG DISLODGED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) IDB
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/
EVA:	2/2
POST-EVA:	/

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: 0110-82829-10

CAUSES: FAULTY VELCRO. FAULTY ADHESIVE ON VELCRO. BAG DISLODGED
DURING DONNING

EFFECTS/RATIONALE:

IDB NOT MANDATORY FOR EVA. MISPOSITIONED BAG COULD CAUSE CREWMAN
DISCOMFORT.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 673 FLIGHT: 2/2

ITEM: INLET VALVE ASSEMBLY
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) IDB
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/2
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:

PART NUMBER: 0110-80010

CAUSES: SEAL THREADS BROKEN FOREIGN MATTER IN VALVE. STREATCHED VALVE

EFFECTS/RATIONALE:

IDB NOT MANDATORY FOR EVA. LEAKAGE WOULD CAUSE CREWMEMBER DISCOMFORT AND MAY IMPAIR VISIBILITY. POSSIBLE MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 674 FLIGHT: 3/3

ITEM: INLET VALVE ASSEMBLY
FAILURE MODE: VALVE FAIL CLOSED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) IDB
- 4) INLET VALVE ASSEMBLY
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES
FLIGHT PHASE HDW/FUNC
PRE-EVA: 3/3
EVA: /
POST-EVA: 3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER: 0110-80010

CAUSES: FOREIGN MATTER IN VALVE. VALVE DEFECTIVE

EFFECTS/RATIONALE:
BAG WILL NOT FILL. IDB NOT MANDATORY FOR EVA.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 675

HIGHEST CRITICALITY HDW/FUNC
FLIGHT: 2/2

ITEM: ROLLON CUFF
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) UCD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES

FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/2
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: PUNCTURE IN ROC, ROC UNSEATED FROM UCD FLANGE OR CREWMAN

EFFECTS/RATIONALE:

UCD NOT MANDATORY TO PERFORM EVA. HOWEVER, LEAKAGE DURING AN EVA WOULD CAUSE CREW PERSON DISCOMFORT AND CAN PRESENT A HAZARD TO THE PURGE VALVE (BY FREEZING AND BLOCKING IT) IF SOP WERE REQUIRED.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 676 FLIGHT: 2/2

ITEM: VALVE
FAILURE MODE: FAILS CLOSED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) UCD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/
EVA:	2/2
POST-EVA:	/

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: DEFECTIVE FLAPPER

EFFECTS/RATIONALE:

UCD NOT MANDATORY FOR EVA; HOWEVER, IF IT WERE TO FAIL CLOSED
URINE WOULD LIKELY ESCAPE TO THE SUIT ENVIRONMENT. POSSIBLE
CREWPERSON DISCOMFORT AND MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86
SUBSYSTEM: EMU
MDAC ID: 677

HIGHEST CRITICALITY HDW/FUNC

FLIGHT: 2/2

ITEM: BLADDER
FAILURE MODE: LEAKAGE

LEAD ANALYST: J. WHITMAN

SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) UCD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/
EVA:	2/2
POST-EVA:	/

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: PUNCTURE OF BLADDER

EFFECTS/RATIONALE:

UCD NOT MANDATORY FOR EVA, BUT LEAKAGE COULD LEAD TO CREWMAN DISCOMFORT. POSSIBLE MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 678 FLIGHT: 2/2

ITEM: BLADDER
FAILURE MODE: MISPOSITIONED

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) UCD
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	/
EVA:	2/2
POST-EVA:	/

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: BAD ADHESIVE ON VELCRO. BAD VELCRO. MISSIZED OR TORN
HARNESS

EFFECTS/RATIONALE:

UCD NOT MANDATORY FOR EVA. BUT MISPOSITIONING COULD LEAD TO
CREWMAN DISCOMFORT AND MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 10/22/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 679 FLIGHT: 2/2

ITEM: HARNESS
FAILURE MODE: HARNESS LOOSE

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3) UCD
- 4) HARNESS
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/3
EVA:	2/2
POST-EVA:	3/3

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: MISSIZED HARNESS TORN HARNESS

EFFECTS/RATIONALE:

UCD NOT MANDATORY TO EVA. IF EVA MISSIZED OR TORN HARNESS COULD
LEAD TO MISPOSITIONED UCD WHICH COULD CAUSE SIGNIFICANT
CREWPERSON DISCOMFORT AND MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 680 FLIGHT: 2/2

ITEM: CCA
FAILURE MODE: LOSS OF POWER TO MIKE/LOSS OF SIGNAL

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	2/2
EVA:	2/2
POST-EVA:	2/2

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRONICS SHORT

EFFECTS/RATIONALE:
LOSS OF TRANSMIT CAPABILITY, MISSION TERMINATION.

REFERENCES:

INDEPENDENT ORBITER ASSESSMENT
ORBITER SUBSYSTEM ANALYSIS WORKSHEET

DATE: 12/02/86 HIGHEST CRITICALITY HDW/FUNC
SUBSYSTEM: EMU
MDAC ID: 681 FLIGHT: 3/2R

ITEM: CCA
FAILURE MODE: LOSS OF SIGNAL TO EARPHONE (1 OF 2)

LEAD ANALYST: J. WHITMAN SUBSYS LEAD: G. RAFFAELLI

BREAKDOWN HIERARCHY:

- 1) EMU
- 2) SSA
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)

CRITICALITIES	
FLIGHT PHASE	HDW/FUNC
PRE-EVA:	3/2R
EVA:	3/2R
POST-EVA:	3/2R

REDUNDANCY SCREENS: A [] B [] C []

LOCATION:
PART NUMBER:

CAUSES: ELECTRONICS OPEN, ELECTRONICS SHORT

EFFECTS/RATIONALE:
LOSS OF RECEIVE CAPABILITY IF BOTH EARPHONES FAIL, MISSION
TERMINATION WOULD THEN RESULT.

REFERENCES:

and the other is the extent to which the program is designed to be a

standalone program or a part of a larger program.

The first of these issues is the extent to which the program is

designed to be a standalone program or a part of a larger program.

The second of these issues is the extent to which the program is

designed to be a standalone program or a part of a larger program.

The third of these issues is the extent to which the program is

designed to be a standalone program or a part of a larger program.

The fourth of these issues is the extent to which the program is

designed to be a standalone program or a part of a larger program.

The fifth of these issues is the extent to which the program is

designed to be a standalone program or a part of a larger program.

The sixth of these issues is the extent to which the program is

designed to be a standalone program or a part of a larger program.

The seventh of these issues is the extent to which the program is

APPENDIX D
POTENTIAL CRITICAL ITEMS

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
100	PRIMARY H2O TANK 1 (ITEM 131)	BLADDER FAILURE (O2/H2O)
101	PRIMARY H2O TANK 1 (ITEM 131)	LEAK-O2 SIDE EXTERNAL
102	PRIMARY H2O TANK 1 (ITEM 131)	LEAK-H2O SIDE, EXTERNAL (OR VIA TPJ)
103	PRIMARY H2O TANK 1 (ITEM 162)	BLADDER FAILURE (O2/H2O)
104	PRIMARY H2O TANK 1 (ITEM 162)	LEAK-O2 SIDE, EXTERNAL
105	PRIMARY H2O TANK 1 (ITEM 162)	LEAK-H2O SIDE, EXTERNAL (AND/OR VIA TPK)
106	RESERVE H2O TANK (ITEM 148)	BLADDER FAILURE (O2/H2O MIX)
107	RESERVE H2O TANK (ITEM 148)	LEAK-O2 SIDE, EXTERNAL
108	RESERVE H2O TANK (ITEM 148)	LEAK-H2O SIDE, EXTERNAL (AND/OR VIA TPC OR TPL)
109	FDW SUPPLY PRESSURE SENSOR (ITEM 132B)	BIASED HIGH (OR FAILED HIGH)
110	FDW SUPPLY PRESSURE SENSOR (ITEM 132B)	BIASED LOW (OR FAILED LOW)
111	FDW SUPPLY PRESSURE SENSOR (ITEM 132B)	EXTERNAL H2O LEAKAGE
112	FDW SUPPLY PRESSURE SENSOR (ITEM 132B)	INTERNAL SHORT
113	WATER RELIEF VALVE (ITEM 142)	INTERNAL LKG/FAIL OPEN TO (PRIMARY TANKS TO RESERVE AND VICE VERSA)
114	WATER RELIEF VALVE (ITEM 142)	FAILURE TO OPEN/FAIL CLOSED
115	WATER RELIEF VALVE (ITEM 142)	EXTERNAL LKG
116	WATER CHECK VALVE (ITEM 143)	INTERNAL LKG (FROM RESERVE TO PRI)
117	WATER CHECK VALVE (ITEM 143)	FAILS CLOSED
118	WATER CHECK VALVE (ITEM 143)	EXTERNAL LEAKAGE (RESERVE TANK SIDE OR PRIMARY TANK SIDE)
119	FEEDWATER PRESSURE REGULATOR (ITEM 136)	REGULATES HIGH (BIASED OR FULL OPEN)
120	FEEDWATER PRESSURE REGULATOR (ITEM 136)	REGULATES LOW (BIASED OR FULL CLOSED)
121	FEEDWATER PRESSURE REGULATOR (ITEM 136)	INTERNAL LKG.
122	FEEDWATER PRESSURE REGULATOR (ITEM 136)	EXTERNAL LKG.
123	FEEDWATER RELIEF VALVE (ITEM 135)	INTERNAL LKG. - FAILS OPEN

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
124	FEEDWATER RELIEF VALVE (ITEM 135)	EXTERNAL LKG - FDW. SIDE
125	FEEDWATER RELIEF VALVE (ITEM 135)	FAILS TO OPEN
126	FEEDWATER SHUTOFF VALVE (ITEM 137)	INTERNAL LEAKAGE
127	FEEDWATER SHUTOFF VALVE (ITEM 137)	EXTERNAL LEAKAGE (EITHER SIDE)
128	FEEDWATER SHUTOFF VALVE (ITEM 137)	FAILS CLOSED
129	FEEDWATER SHUTOFF VALVE (ITEM 137)	FAILS OPEN
130	FEEDWATER SHUTOFF VALVE (ITEM 137)	ELECTRONICS SHORT
131	FEEDWATER SHUTOFF VALVE (ITEM 137)	EXCESSIVE/CONTINUOUS CURRENT DRAW - (WILL NOT SHUT OFF)
134	FEEDWATER PRESSURE SENSOR (ITEM 138)	EXTERNAL LEAKAGE
135	FEEDWATER PRESSURE SENSOR (ITEM 138)	INTERNAL SHORT
136	SUBLIMATOR (ITEM 140)	EXTERNAL H2O FDW LEAKAGE
137	SUBLIMATOR (ITEM 140)	SUBLIMATOR BLOCKED
138	SUBLIMATOR (ITEM 140)	EXTERNAL LCG H2O LEAKAGE
139	SUBLIMATOR (ITEM 140)	INTERNAL LCG-TO-FDW LEAKAGE
140	SUBLIMATOR (ITEM 140)	INTERNAL LCG-VENT LOOP LEAKAGE (H2O AND O2)
141	SUBLIMATOR (ITEM 140)	EXTERNAL VENT LOOP LEAKAGE
142	SUBLIMATOR (ITEM 140)	SLURPER BLOCKED
143	TEMPERATURE SENSOR & HARNESS (ITEM 139)	EXTERNAL LEAKAGE OF H2O
145	TEMPERATURE SENSOR & HARNESS (ITEM 139)	ELECTRICAL SHORT
147	PITOT ACTUATED VALVE (ITEM 125)	INTERNAL LEAKAGE VIA NORMAL TRAP FLOW PATHS (GAS TRAP INLET TO VALVE OUTLET TO WATER SEPARATOR)
148	PITOT ACTUATED VALVE (ITEM 125)	INTERNAL LEAKAGE FROM GAS TRAP INLET TO SENSE PORT
149	PITOT ACTUATED VALVE (ITEM 125)	EXTERNAL LEAKAGE (INLET FROM GAS TRAP, OUTLET TO H2O SEPARATOR, AND VIA SHAFT SEAL)
150	PITOT ACTUATED VALVE (ITEM 125)	INLET FILTER BLOCKED
151	PITOT ACTUATED VALVE (ITEM 125)	FAILS CLOSED
152	CHECK VALVE AND HOUSING (ITEM 128)	EXTERNAL LEAKAGE OF H2O
153	CHECK VALVE AND HOUSING (ITEM 128)	INTERNAL H2O LEAKAGE/FAILED OPEN
154	CHECK VALVE AND HOUSING (ITEM 128)	FAILED CLOSED
155	PUMP INLET FILTER (ITEM 127)	EXTERNAL LEAKAGE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
156	PUMP INLET FILTER (ITEM 127)	BLOCKED
157	PUMP INLET FILTER (ITEM 127)	PASSAGE OF CONTAMINANTS
158	GAS TRAP (ITEM 141)	EXTERNAL LEAKAGE
159	GAS TRAP (ITEM 141)	GAS BREAKTHROUGH
160	GAS TRAP (ITEM 141)	SCREEN BLOCKED
161	GAS TRAP (ITEM 141)	INTERNAL LEAKAGE (H2O INLET TO GAS OUTLET)
162	CONDENSATE H2O RELIEF VALVE (ITEM 134)	EXTERNAL LEAKAGE OF H2O
163	CONDENSATE H2O RELIEF VALVE (ITEM 134)	FAILS OPEN
164	CONDENSATE H2O RELIEF VALVE (ITEM 134)	BLOCKED INLET FILTER (FAILS CLOSED)
165	CONDENSATE H2O RELIEF VALVE (ITEM 134)	VALVE FAILS CLOSED
167	H2O SHUTOFF VALVE (ITEM 171)	EXTERNAL LEAKAGE
169	H2O SHUTOFF VALVE (ITEM 171)	FAILS CLOSED (NO FDW FLOW PATH TO LCG COOLING LOOPS)
170	H2O SHUTOFF VALVE (ITEM 171)	CONTINUOUS MOTOR DRAW OF CURRENT
171	H2O SHUTOFF VALVE (ITEM 171)	FILTER ELEMENT BLOCKED
172	H2O SHUTOFF VALVE (ITEM 171)	ELECTRICAL SHORT
173	COOLANT RELIEF VALVE (ITEM 172)	EXTERNAL LEAKAGE
174	COOLANT RELIEF VALVE (ITEM 172)	FAILS OPEN
175	COOLANT RELIEF VALVE (ITEM 172)	BLOCKED INLET FILTER
176	COOLANT RELIEF VALVE (ITEM 172)	VALVE FAILS CLOSED
178	ROTARY H2O SEPARATOR (ITEM 123B)	PITOT TUBE (H2O OUTLET) BLOCKED
179	ROTARY H2O SEPARATOR (ITEM 123B)	EXTERNAL LEAKAGE (H2O OUTLET OR H2O/GAS INLET)
180	ROTARY H2O SEPARATOR (ITEM 123B)	BEARINGS BIND
181	WATER PUMP (ITEM 123C)	EXTERNAL LEAKAGE (H2O INLET OR OUTLET)
182	WATER PUMP (ITEM 123C)	REDUCED FLOW
183	WATER PUMP (ITEM 123C)	INTERNAL LEAKAGE
184	FAN (ITEM 123A)	EXTERNAL LEAKAGE-O2
185	FAN (ITEM 123A)	LOW FLOW
186	BRUSHLESS MOTOR (ITEM 123B)	BEARINGS BIND OR SEIZE
187	BRUSHLESS MOTOR (ITEM 123B)	FAILS OFF

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
188	BRUSHLESS MOTOR (ITEM 123B)	LOW SPEED
189	BRUSHLESS MOTOR (ITEM 123B)	HIGH SPEED (EXCESSIVE)
190	BRUSHLESS MOTOR (ITEM 123B)	SHORT
191	MUFFLER (ITEM 170)	EXTERNAL LEAKAGE (INLET OR OUTLET)
192	CONTAMINANT CONTROL CARTRIDGE (ITEM 480)	EXTERNAL LEAKAGE
193	CONTAMINANT CONTROL CARTRIDGE (ITEM 480)	PARTICULATE FILTER PARTIALLY BLOCKED
194	CONTAMINANT CONTROL CARTRIDGE (ITEM 480)	TEFLON SCREEN PARTIALLY BLOCKED
195	CONTAMINANT CONTROL CARTRIDGE (ITEM 480)	INTERNAL LEAKAGE
196	CONTAMINANT CONTROL CARTRIDGE (ITEM 480)	LiOH RELEASED TO VENT LOOP
197	CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)	EXTERNAL LEAKAGE
198	CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)	VALVE FAILS CLOSED
199	CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)	SENSOR FAILS LOW
200	CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)	VALVE FAILS OPEN-INTERNAL LEAKAGE
201	CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)	SENSOR FAILS HIGH
202	CHECK VALVE AND VENT FLOW SENSOR (ITEM 121)	SHORT
203	CO2 TRANSDUCER (ITEM 122)	EXTERNAL LEAKAGE
204	CO2 TRANSDUCER (ITEM 122)	SENSOR FAILS HIGH
205	CO2 TRANSDUCER (ITEM 122)	SENSOR FAILS LOW
206	CO2 TRANSDUCER (ITEM 122)	ELECTRICAL SHORT
207	FILTER AND ORIFICE (ITEM 126)	EXTERNAL LEAKAGE
208	FILTER AND ORIFICE (ITEM 126)	ORIFICE BLOCKED
211	PRESSURE SUIT SENSOR (ITEM 114)	EXTERNAL LEAKAGE
212	PRESSURE SUIT SENSOR (ITEM 114)	INTERNAL SHORT
213	RELIEF VALVE AND ORIFICE (ITEM 145)	EXTERNAL LEAKAGE
214	RELIEF VALVE AND ORIFICE (ITEM 145)	INTERNAL LEAKAGE/FAILS OPEN
215	RELIEF VALVE AND ORIFICE (ITEM 145)	FAILS CLOSED

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
216	POSITIVE PRESSURE RELIEF VALVE (ITEM 146)	EXTERNAL LEAKAGE
217	POSITIVE PRESSURE RELIEF VALVE (ITEM 146)	FAILS OPEN/INTERNAL LEAKAGE
218	POSITIVE PRESSURE RELIEF VALVE (ITEM 146)	FAILS CLOSED
219	NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)	EXTERNAL LEAKAGE
220	NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)	FAIL OPEN
221	NEGATIVE PRESSURE RELIEF VALVE (ITEM 147)	FAIL CLOSED
222	CHECK VALVE AND FILTER (ITEM 113A)	EXTERNAL LEAKAGE AT INLET
223	CHECK VALVE AND FILTER (ITEM 113A)	EXTERNAL LEAKAGE AT OUTLET
224	CHECK VALVE AND FILTER (ITEM 113A)	INLET OR OUTLET FILTER BLOCKED
225	CHECK VALVE AND FILTER (ITEM 113A)	INLET FILTER FAILS-PASSES CONTAMINANTS
226	CHECK VALVE AND FILTER (ITEM 113A)	OUTLET FILTER FAILS-PASSES CONTAMINANTS
227	CHECK VALVE AND FILTER (ITEM 113A)	VALVE FAILS CLOSED
228	CHECK VALVE AND FILTER (ITEM 113A)	VALVE FAILS OPEN-INTERNAL LEAKAGE
229	ADJUSTABLE ORIFICE (ITEM 113B)	EXTERNAL LEAKAGE
230	ADJUSTABLE ORIFICE (ITEM 113B)	NO FLOW-BLOCKED
231	ADJUSTABLE ORIFICE (ITEM 113B)	HIGH FLOW
232	ON/OFF VALVE (ITEM 113C)	EXTERNAL LEAKAGE
233	ON/OFF VALVE (ITEM 113C)	FAILED CLOSED
234	ON/OFF VALVE (ITEM 113C)	FAILED OPEN/INTERNAL LEAKAGE
235	PRIMARY REGULATOR (ITEM 113D)	EXTERNAL LEAKAGE
236	PRIMARY REGULATOR (ITEM 113D)	INTERNAL LEAKAGE/FAILED OPEN
237	PRIMARY REGULATOR (ITEM 113D)	FAILS CLOSED
238	PRIMARY REGULATOR (ITEM 113D)	REGULATES LOW/DRIFTS LOW
239	PRIMARY REGULATOR (ITEM 113D)	REGULATES HIGH/DRIFTS HIGH
240	PRIMARY REGULATOR (ITEM 113D)	IV-EV LINKAGE FAILURE
241	H2O REGULATOR (ITEM 113E)	EXTERNAL LEAKAGE
242	H2O REGULATOR (ITEM 113E)	FAILS OPEN-INTERNAL LEAKAGE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
243	H2O REGULATOR (ITEM 113E)	REGULATES HIGH
244	H2O REGULATOR (ITEM 113E)	REGULATES LOW
245	H2O REGULATOR (ITEM 113E)	FAILS CLOSED
246	PRIMARY OXYGEN BOTTLES (ITEM 111)-QTY-2	EXTERNAL LEAKAGE (NON-VIOLENT)
247	PRIMARY OXYGEN BOTTLES (ITEM 111)-QTY-2	RUPTURE-VIOLENT OXYGEN RELEASE
248	PRIMARY O2 PRESSURE SENSOR (ITEM 112)	EXTERNAL LEAKAGE
249	PRIMARY O2 PRESSURE SENSOR (ITEM 112)	DRIFTS LOW (NOT FULL SCALE)
250	PRIMARY O2 PRESSURE SENSOR (ITEM 112)	FAILS FULL LOW
251	PRIMARY O2 PRESSURE SENSOR (ITEM 112)	DRIFTS HIGH (NOT FULL SCALE)
252	PRIMARY O2 PRESSURE SENSOR (ITEM 112)	FAILS HIGH-FULL SCALE
253	PRIMARY O2 PRESSURE SENSOR (ITEM 112)	BOURDON TUBE RUPTURE
254	PRIMARY O2 PRESSURE SENSOR (ITEM 112)	ELECTRICAL SHORT
255	SHEAR PLATE ASSEMBLY (ITEM 115)	O2 MANIFOLD FILTER BLOCKED
256	SHEAR PLATE ASSEMBLY (ITEM 115)	O2 MANIFOLD FILTER PASSES CONTAMINANTS
257	SHEAR PLATE ASSEMBLY (ITEM 115)	EXTERNAL LEAKAGE OF OXYGEN
258	SHEAR PLATE ASSEMBLY (ITEM 115)	EXTERNAL LEAKAGE OF OXYGEN
259	SHEAR PLATE ASSEMBLY (ITEM 115)	FAILS IN THE "OFF" POSITION
260	SHEAR PLATE ASSEMBLY (ITEM 115)	FAILS IN THE "IV" POSITION
261	SHEAR PLATE ASSEMBLY (ITEM 115)	FAILS IN THE "PRESS" POSITION
262	SHEAR PLATE ASSEMBLY (ITEM 115)	FAILS IN THE "EVA" POSITION
263	SHEAR PLATE ASSEMBLY (ITEM 115)	FAILURE TO OPEN THE PRIMARY 113C SHUTOFF VALVE
264	SHEAR PLATE ASSEMBLY (ITEM 115)	FAILURE TO CLOSE THE PRIMARY 113 SHUTOFF VALVE
265	SHEAR PLATE ASSEMBLY	FAILURE TO OPEN SOP SHUTOFF VALVE
266	SHEAR PLATE ASSEMBLY	FAILURE TO CLOSE SOP SHUTOFF VALVE
268	SHEAR PLATE ASSEMBLY	FAILURE TO PLACE PRIMARY REGULATOR IN 4.3 PSI POSITION
270	SHEAR PLATE ASSEMBLY (ITEM 115)	EVA POSITION LOCK FAILURE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
271	EVA POSITION SWITCH (ITEM 116)	FAILS OPEN-NO SIGNAL
272	EVA POSITION SWITCH (ITEM 116)	FAILS CLOSED-CONTINUOUS SIGNAL
273	BLEED ORIFICE (ITEM 120A)	EXTERNAL LEAKAGE
274	BLEED ORIFICE (ITEM 120A)	INTERNAL LEAKAGE
275	BLEED ORIFICE (ITEM 120A)	BLOCKED
276	DUAL MODE RELIEF VALVE (ITEM 120B)	EXTERNAL LEAKAGE
277	DUAL MODE RELIEF VALVE (ITEM 120B)	INTERNAL LEAKAGE/(HI OR LOW FLOW) FAILS OPEN
278	DUAL MODE RELIEF VALVE (ITEM 120B)	FAIL CLOSED ("LO" MODE)
279	DUAL MODE RELIEF VALVE (ITEM 120B)	FAILS CLOSED ("HI" MODE)
280	FEEDWATER CHECK VALVE (ITEM 120C)	EXTERNAL LEAKAGE
281	FEEDWATER CHECK VALVE (ITEM 120C)	FAILED OPEN
282	FEEDWATER CHECK VALVE (ITEM 120C)	FAILED CLOSED
283	FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)	EXTERNAL LEAKAGE
286	FDW SUPPLY PRESSURE SENSOR-02 SIDE (ITEM 132A)	INTERNAL SHORT
287	BATTERY (ITEM 490)	EXTERNAL LEAKAGE
288	BATTERY (ITEM 490)	RELIEF VALVE FAILS OPEN (INTERNAL LEAKAGE)
289	BATTERY (ITEM 490)	RELIEF VALVE FAILS CLOSED
290	BATTERY (ITEM 490)	GENERATION OF HYDROGEN GAS
291	BATTERY (ITEM 490)	HIGH RESISTANCE OR OPEN
292	BATTERY (ITEM 490)	SHORT
295	SECONARY OXYGEN BOTTLE (ITEM 210)	EXTERNAL LEAKAGE (NON-VIOLENT)
296	SECONARY OXYGEN BOTTLE (ITEM 210)	BOTTLE RUPTURE (VIOLENT)
297	PRESSURE TRANSDUCER (ITEM 215)	EXTERNAL LEAKAGE
298	PRESSURE TRANSDUCER (ITEM 215)	INTERNAL LEAKAGE
299	PRESSURE TRANSDUCER (ITEM 215)	ELECTRONICS SHORT
301	PRESSURE TRANSDUCER (ITEM 215)	READS LOW
302	1ST STAGE REGULATOR (ITEM 213B)	EXTERNAL LEAKAGE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
303	1ST STAGE REGULATOR (ITEM 213B)	INTERNAL LEAKAGE/FAIL OPEN
304	1ST STAGE REGULATOR (ITEM 213B)	REGULATES HIGH
305	1ST STAGE REGULATOR (ITEM 213B)	REGULATES LOW
306	1ST STAGE REGULATOR (ITEM 213B)	FAILS CLOSED
307	1ST STAGE REGULATOR (ITEM 213B)	DIAPHRAM RUPTURE
308	2ND STAGE REGULATOR (ITEM 213D)	EXTERNAL LEAKAGE
309	2ND STAGE REGULATOR (ITEM 213D)	INTERNAL LEAKAGE/FAIL OPEN
310	2ND STAGE REGULATOR (ITEM 213D)	REGULATES HIGH
311	2ND STAGE REGULATOR (ITEM 213D)	REGULATES LOW
312	2ND STAGE REGULATOR (ITEM 213D)	FAILS CLOSED
313	2ND STAGE REGULATOR (ITEM 213D)	MECHANICAL LINKAGE FAILS ENGAGED
314	SOP PRESSURE GAGE (ITEM 213E)	EXTERNAL LEAKAGE
315	SOP PRESSURE GAGE (ITEM 213E)	BOURDN TUBE RUPTURE
318	SOP FILL PORT QD AND FILTER (ITEM 213F)	EXTERNAL LEAKAGE/INTERNAL LEAKAGE
320	SOP FILL PORT QD AND FILTER (ITEM 213F)	FILTER PASSES CONTAMINANTS
321	SOP ASSEMBLY (ITEM 200)	BOTTLE INLET FILTER BLOCKED (ONE FILTER FOR EACH BOTTLE)
322	SOP ASSEMBLY (ITEM 200)	EXTERNAL LEAKAGE
324	COMMON MULTIPLE CONNECTOR (ITEM 410)	EXTERNAL LEAKAGE-FEEDWATER SUPPLY/DRAIN LINE
326	COMMON MULTIPLE CONNECTOR (ITEM 410)	CONNECTOR DOES NOT LATCH CLOSED
327	COMMON MULTIPLE (ITEM 410)	CONNECTOR DOES NOT RELEASE OPEN
336	HIGH PRESSURE OXYGEN LINE (ITEM 411)	EXTERNAL LEAKAGE
337	PORTABLE H2O LINE (ITEM 412A)	EXTERNAL LEAKAGE
338	COOLING H2O IN-LINE (ITEM 412B)	EXTERNAL LEAKAGE
339	COOLING H2O OUT-LINE (ITEM 412C)	EXTERNAL LEAKAGE
340	BACTERIAL FILTER HOUSING (ITEM 416)	EXTERNAL LEAKAGE
341	CONDENSATE H2O REGULATOR (ITEM 418)	EXTERNAL LEAKAGE (EMU SIDE)

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
344	CONDENSATE H2O REGULATOR (ITEM 418)	FAILS CLOSED
346	CONDENSATE H2O REGULATOR (ITEM 418)	REGUALTES HIGH
348	WATER SUPPLY PRESSURE REGULATOR (ITEM 419)	EXTERNAL LEAKAGE
352	BACTERIA CARTRIDGE (ITEM 423)	INLET SECREEN BLOCKED/NO FLOW (WASTE SIDE)
353	BACTERIA CARTRIDGE (ITEM 423)	FAILURE OF CARTRIDGE (SUPPLY OR WASTER) TO CONTROL BACTERIA
355	POTABLE H2O FILTER (ITEM 424)	BLOCKED/CLOGGED (WASTE SIDE)
359	SUIT PRESSURE GAGE (ITEM 311)	EXTERNAL LEAKAGE
360	SUIT PRESSURE GAGE (ITEM 311)	BOURDON TUBE RUPTURE (VIOLENT)
364	DCM PURGE VALVE (ITEM 314)	EXTERNAL LEAKAGE/INTERNAL LEAKAGE
365	DCM PURGE VALVE (ITEM 314)	INLET FILTER BLOCKED
366	DCM PURGE VALVE (ITEM 314)	FAILED CLOSED
367	DCM PURGE VALVE (ITEM 314)	FAIL OPEN
368	DCM PURGE VALVE (ITEM 314)	REDUCED FLOW
369	COMMON MULTIPLE CONNECTOR (ITEM 330)	EXTERNAL LEAKAGE-OXYGEN
370	COMMON MULTIPLE CONNECTOR (ITEM 330)	EXTERNAL LEAKAGE-FEEDWATER SUPPLY/DRAIN LINE
371	COMMON MULTIPLE CONNECTOR (ITEM 330)	EXTERNAL LEAKAGE-LCG INLET-LCG OUTLET
372	COMMON MULTIPLE CONNECTOR (ITEM 330)	FAILS TO MATE TO SCU
373	COMMON MULTIPLE CONNECTOR (ITEM 330)	FAILS TO DEMATE FROM SCU
374	COMMON MULTIPLE CONNECTOR (ITEM 330)	OPEN IN POWER LINE
375	COMMON MULTIPLE CONNECTOR (ITEM 330)	SHORT IN POWER LINE
377	COMMON MULTIPLE CONNECTOR (ITEM 330)	SHORT IN BATTERY RECHARGE LINE
384	COMMON MULTIPLE CONNECTOR (ITEM 330)	OXYGEN FLOW BLOCKED
387	COMMON MULTIPLE CONNECTOR (ITEM 330)	LCG IN/OUT VALVE FAILS CLOSED
388	HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)	VENT LOOP INTERFACE LEAKAGE (P2 OR P3)
389	HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)	COOLING LOOP INTERFACE LEAKAGE (P4,P5,P6, OR P7)
390	HARD UPPER TORSO (HUT) INTERFACE (ITEM 385)	POTABLE H2O LEAKAGE (P8)

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
394	VOLUME CONTROL (ITEM 360)	SHORT ACROSS TWO COMMUNICATIONS CHANNELS
396	DISPLAY INTENSITY CONTROL (ITEM 361)	OPEN IN LINE
397	DISPLAY INTENSITY CONTROL (ITEM 361)	SHORT ACROSS DISPLAY LINES
398	DISPLAY INTENSITY CONTROL (ITEM 361)	INCREASED RESISTANCE
399	DISPLAY INTENSITY CONTROL (ITEM 361)	SHAFT BINDS
400	EVC SELECTOR SWITCH (ITEM 362)	OPEN IN PRIMARY HARDLINE (IV COMMUNICATIONS) POSITION
402	EVC SELECTOR SWITCH (ITEM 362)	OPEN IN PRIMARY MODE A POSITION
404	EVC SELECTOR SWITCH (ITEM 362)	OPEN IN PRIMARY MODE B POSITION
406	EVC SELECTOR SWITCH (ITEM 362)	OPEN IN PRIMARY BACKUP POSITION
408	EVC SELECTOR SWITCH (ITEM 362)	SHORT TO GROUND PRIMARY
410	EVC SELECTOR SWITCH (ITEM 362)	SWITCH FAILS IN HARDLINE POSITION
415	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN FOR BATTERY POWER FROM BATTERY (T8 OPEN) STICKS IN T7 POSITION
416	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN FOR BATTERY CHARGE CONTACT (T9 OPEN)
417	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN FOR VEHICLE POWER (T4 OPEN)-STICKS IN T5 POSITION
418	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN FOR BATTERY POWER TO FAN AND TO DC/DC CONVERTER (T5 OPEN)-STICKS IN T4 POSITION
419	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN FOR FAN POWER AND DC/DC CONVERTER (T6 OPEN)
420	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN (T1 OPEN)- STICKS IN T2 POSITION
421	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN FOR BATTERY POWER TO EVC (T2 OPEN)-STICKS IN T1 POSITION
422	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH FAILS OPEN FOR CONTACT TO EVC POWER (T3 OPEN)
423	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH STAYS IN VEHICLE POWER POSITION
424	POWER MODE SELECTOR SWITCH (ITEM 364)	SWITCH STAYS IN BATTERY POWER POSITION
425	POWER MODE SELECTOR SWITCH (ITEM 364)	SHORT-VEHICLE POWER (ANY CONTACT) TO GROUND
426	POWER MODE SELECTOR SWITCH (ITEM 364)	SHORT-BATTERY POWER (ANY CONTACT) TO GROUND

430	PUSH-TO-TALK SWITCH (ITEM 365)	SHORT IN PTT POSITION
434	PUSH-TO-TALK SWITCH (ITEM 365)	FAIL CLOSED IN RECEIVE POSITION
435	PUSH-TO-TALK SWITCH (ITEM 365)	FAIL CLOSED IN PTT POSITION
436	PUSH-TO-TALK SWITCH (ITEM 365)	SWITCH FAILS OPEN ALL POSITION
437	FAN SWITCH (ITEM 366)	FAN POWER ON CONTACT OPEN/FAILS OFF
438	FAN SWITCH (ITEM 366)	FAN POWER ON CONTACT SHORT TO GROUND
439	FAN SWITCH (ITEM 366)	CLIV POWER "OPEN" LINE/CONTACT OPEN
440	FAN SWITCH (ITEM 366)	CLIV POWER "CLOSE" LINE/CONTACT OPEN
441	FAN SWITCH (ITEM 366)	CLIV POWER SHORT TO GROUND
442	FAN SWITCH (ITEM 366)	FAN POWER SHORT TO GROUND
443	FAN SWITCH (ITEM 366)	SWITCH FAILS OFF
445	FEEDWATER VALVE SWITCH (ITEM 367)	ELECTRICAL OPEN ON FEEDWATER OPEN LINE
446	FEEDWATER VALVE SWITCH (ITEM 367)	ELECTRICAL OPEN ON FEEDWATER CLOSE LINE
447	FEEDWATER VALVE SWITCH (ITEM 367)	ELECTRICAL SHORT ON FEEDWATER OPEN LINE
448	FEEDWATER VALVE SWITCH (ITEM 367)	ELECTRICAL SHORT ON FEEDWATER CLOSE LINE
449	FEEDWATER VALVE SWITCH (ITEM 367)	SWITCH FAILS IN THE CLOSED POSITION
450	FEEDWATER VALVE SWITCH (ITEM 367)	SWITCH FAILS IN THE OPEN POSITION
451	CAUTION AND WARNING SWITCH (ITEM 368)	OPEN IN STATUS LINE
452	CAUTION AND WARNING SWITCH (ITEM 368)	OPEN IN PROGRAM LINE
453	CAUTION AND WARNING SWITCH (ITEM 368)	SHORT TO GROUND IN STATUS LINE
454	CAUTION AND WARNING SWITCH (ITEM 368)	SHORT TO GROUND IN PROGRAM LINE
455	CAUTION AND WARNING SWITCH (ITEM 368)	BEARING FAILS IN "STATUS" POSITION
456	CAUTION AND WARNING SWITCH (ITEM 368)	SWITCH FAILS IN "PROGRAM" POSITION
457	BITE INDICATOR (ITEM 363)	OPEN IN ELECTRICAL INPUT/FAILED OFF
458	BITE INDICATOR (ITEM 363)	SHORT TO BITE INDICATOR CIRCUIT/FAILED ON
459	ALPHANUMERIC DISPLAY (ITEM 369)	SUPPLY VOLTAGE (VCC) OPEN TO ALL THREE CHIPS/DISPLAY FAILS OFF TOTALLY
460	ALPHANUMERIC DISPLAY (ITEM 369)	ERRATIC DISPLAY/LED DRIVER OR COLUMN DRIVER FAILURE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
461	CAUTION AND WARNING ELECTRONICS (ITEM 150)	DISPLAY I/O PORT FAILS OFF
462	CAUTION AND WARNING ELECTRONICS (ITEM 150)	MEMORY 5.V POWER-IN FAILURE
463	CAUTION AND WARNING ELECTRONICS (ITEM 150)	SYSTEM CLOCK OUTPUT OPEN
464	CAUTION AND WARNING ELECTRONICS (ITEM 150)	MULTIPLEXER INPUT POWER FAILURE
465	CAUTION AND WARNING ELECTRONICS (ITEM 150)	ANALOG TO DIGITAL CONVERTER FAILURE
466	CAUTION AND WARNING ELECTRONICS (ITEM 150)	BITE CIRCUIT FAILS ON
467	CAUTION AND WARNING ELECTRONICS (ITEM 150)	BITE CIRCUIT FAILS OFF
475	DCM ELECTRONICS (ITEM 350)	EVC PRIMARY/CLIV-CURRENT LIMITER SHORTS TO GROUND AT INLET
477	DCM ELECTRONICS (ITEM 350)	EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORT TO GROUND AT INLET
479	DCM ELECTRONICS (ITEM 350)	EVC PRIMARY/CLIV CURRENT LIMITER SHORTS TO GROUND AT CLIV POWER OUT
480	DCM ELECTRONICS (ITEM 350)	EVC SEC/FEEDWATER VALVE CURRENT LIMITER SHORTS TO GROUND AT FEEDWATER VALVE POWER OUT
481	DCM ELECTRONICS (ITEM 350)	EVC PRI/CLIV CURRENT LIMITER HAS ELECTRICAL OPEN ON POWER IN OR POWER OUT LINE FOR CLIV
483	DCM ELECTRONICS (ITEM 350)	EVC SEC/FEEDWATER VALVE CURRENT LIMITER HAS ELECTRICAL OPEN ON FEEDWATER VALVE POWER IN/OUT
484	DCM ELECTRONICS (ITEM 350)	EVC PRIMARY/CLIV CURRENT LIMITER HAS ELECTRICAL OPEN ON EVC PRI POWER OUT
485	DCM ELECTRONICS (ITEM 350)	OPEN IN POWER IN TO DC/DC CONVERTER TAP T1
486	DCM ELECTRONICS (ITEM 350)	OPEN IN POWER IN TO DC/DC CONVERTER TAP T3
487	DCM ELECTRONICS (ITEM 350)	OPEN IN POWER IN TO DC/DC CONVERTER TAP 2
488	DCM ELECTRONICS (ITEM 350)	SHORT TO GROUND IN ANY DC/DC CONVERTER INPUT LINE (DOWNSTREAM LINE OF CONVERTER CURRENT LIMITER)
489	DCM ELECTRONICS	SHORT TO GROUND AT INPUT OF DC/DC CONVERTER CURRENT LIMITER
490	DCM ELECTRONICS	SHORT TO GROUND ON DC/DC CONVERTER 5V DC OUT

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
491	DCM ELECTRONICS	OPEN IN DC/DC CONVERTER 5V DC OUT
492	DCM ELECTRONICS	OPEN IN +14.2V OUT (FROM DC/DC CONVERTER)
493	DCM ELECTRONICS	OPEN IN 3.8V OUT FROM DC/DC CONVERTER
494	DCM ELECTRONICS	SHORT IN 3.8V OUT FROM DC/DC CONVERTER
495	DCM ELECTRONICS	SHORT IN +14.2V OUT (FROM DC/DC CONVERTER)
497	DCM ELECTRONICS	SHORT IN 18V OUTPUT FROM DC/DC CONVERTER
498	DCM ELECTRONICS	OPEN IN LINE TO TONE GENERATOR
499	DCM ELECTRONICS	FAILED ON TONE GENERATOR
500	COOLING CONTROL VALVE (ITEM 321)	EXTERNAL LEAKAGE
501	COOLING CONTROL VALVE (ITEM 321)	INTERNAL LEAKAGE
502	COOLING CONTROL VALVE (ITEM 321)	JAMS FULL COLD OR FULL HOT
600	NECK RING AND VENT SEAL ASSEMBLY	JAM OF LOCK MECHANISM (CAN NOT MATE TO HELMET FROM NECK RING 1)
601	NECK RING AND VENT SEAL ASSEMBLY	JAM OF LOCK MECHANISM (CAN NOT DEMATE HELMET FROM NECK RING)
602	NECK RING AND VENT SEAL ASSEMBLY	LEAKAGE OF NECK RING
603	NECK RING AND VENT SEAL ASSEMBLY	NECK RING FAILURE
604	WATER LINE AND VENT TUBE ASSEMBLY	WATER FLOWN BLOCKAGE
605	WATER LINE AND VENT TUBE ASSEMBLY	WATER LINE LEAKAGE
606	WATER LINE AND VENT TUBE ASSEMBLY	O2 LEAKAGE DIRECTLY TO HUT
608	MULTIPLE WATER CONNECTOR (HUT HALF)	JAM. FAIL TO MATE WITH LCVG HALF OF CONNECTOR
609	MULTIPLE WATER CONNECTOR (HUT HALF)	JAM. FAIL TO DEMATE WITH LCVG HALF OF CONNECTOR
610	MULTIPLE WATER CONNECTOR (HUT HALF)	LEAKAGE-MATED
611	HARD UPPER TORSO SHELL	LEAKAGE
612	HARD UPPER TORSO SHELL	UNABLE TO MATE EEH. TO CCA
613	GIMBAL ASSY.	DISATTACHMENT OF PIVOTS
614	BELLOWS ASSEMBLY	LEAKAGE
615	BODY SEAL CLOSURE (HUT SIDE)	LEAKAGE
616	BODY SEAL CLOSURE (HUT SIDE)	FAILURE TO MATE
617	BODY SEAL CLOSURE (HUT SIDE)	FAILURE TO DEMATE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
618	BODY SEAL CLOSURE (HUT SIDE)	LOCK MECHANISM FAILURE-OPEN
621	COMBINATION PURGE VALVE	FAIL OPEN/INTERNAL LEAKAGE
622	HELMET ASSEMBLY	LEAKAGE
623	EXTRAVEHICULAR VISOR ASSEMBLY	JAM OF SUN VISOR (SUN VISORS) IN OPEN POSITION
625	EXTRAVEHICULAR VISOR ASSEMBLY	CRACK IN SUN VISOR (SUN VISORS)
626	EXTRAVEHICULAR VISOR ASSEMBLY	CRAZING (SCRATCHING) IN GOLD SUN VISOR
627	UPPER/LOWER ARM RESTRAINT AND BLADDER ASSEMBLY	LEAKAGE
628	UPPER/LOWER ARM RESTRAINT AND BLADDER ASSEMBLY	LOSS OF PRIMARY AXIAL RESTRAINT
629	SCYE BEARING ASSEMBLY	LEAKAGE
630	SCYE BEARING ASSEMBLY	BEARING TORQUES HIGH
631	ARM BEARING ASSEMBLY	LEAKAGE
632	ARM BEARING ASSEMBLY	BEARING TORQUES HIGH
633	WRIST DISCONNECT	LOCK/JAM OPEN
634	WRIST DISCONNECT	LOCK JAM CLOSED
635	WRIST DISCONNECT	LEAKAGE
636	WRIST DISCONNECT	LOCK FAILURE
637	RESTRAINT MODIFIED	RESTRAINT LAYER AND BLADDER SEPARATION
638	RESTRAINT MODIFIED	SIZING LINES IN FINGERS FAILED
639	RESTRAINT MODIFIED	PALM BAR SEPARATED FROM POSITION
640	RESTRAINT MODIFIED	PRIMARY AXIAL RESTRAINT SEPARATED
641	BLADDER ASSEMBLY	LEAKAGE
642	WRIST DISCONNECT (GLOVE SIDE)	LEAKAGE
643	WRIST DISCONNECT (GLOVE SIDE)	BEARING TORQUE HIGH
644	PALM RESTRAINT	PALM BAR RESTRAINT SLIPPED
645	PALM RESTRAINT	PALM BAR BENT
646	WAIST RESTRAINT AND BLADDER	LEAKAGE
647	WAIST RESTRAINT AND BLADDER	LOSS OF PRIMARY AXIAL RESTRAINT
648	WAIST BEARING	LEAKAGE
649	WAIST BEARING	BEARING TORQUES HIGH
650	LOWER TORSO RESTRAINT/BLADDER ASSEMBLY	LEAKAGE
651	LOWER TORSO RESTRAINT/BLADDER ASSEMBLY	LOSS OF PRIMARY AXIAL RESTRAINT
652	BOOT DISCONNECT	LEAKAGE
653	PRESSURE BOOT ASSEMBLY	LEAKAGE

<u>MDAC-ID</u>	<u>ITEM</u>	<u>FAILURE MODE</u>
654	PRESSURE BOOT ASSEMBLY	LOSS OF PRIMARY AXIAL RESTRAINT
656	BODY SEAL CLOSURE (LTA SIDE)	JAMMED OPEN
657	BODY SEAL CLOSURE (LTA SIDE)	JAMMED CLOSED
658	BODY SEAL CLOSURE (LTA SIDE)	LEAKAGE
659	BODY SEAL CLOSURE (LTA SIDE)	LOCK MECHANISM FAILURE
662	RESTRAINT ASSEMBLY	PUNCTURED OR LEAKING WATER TUBING
664	VENT MANIFOLD AND DUCTS	IMPAIRMENT OF FLOW THROUGH DUCTS AND MANIFOLD
665	VENT MANIFOLD AND DUCTS	COMPLETE BLOCKAGE OF FLOW THROUGH DUCTS AND MANIFOLDS
666	MULTIPLE CONNECTOR (LCVG HALF)	WILL NOT MATE WITH HUT HALF
668	MULTIPLE CONNECTOR (LCVG HALF)	LEAKAGE WHEN MATED
669	BITE VALVE ASSEMBLY	LEAKAGE
671	BLADDER ASSEMBLY	LEAKAGE
672	BLADDER ASSEMBLY	BAG DISLODGED
673	INLET VALVE ASSEMBLY	LEAKAGE
675	ROLLON CUFF	LEAKAGE
676	VALVE	FAILS CLOSED
677	BLADDER	LEAKAGE
678	BLADDER	MISPOSITIONED
679	HARNESS	HARNESS LOOSE
680	CCA	LOSS OF POWER TO MIKE/LOSS OF SIGNAL

